

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

Number 1583

Konkoly Observatory  
Budapest  
1979 April 9

PHOTOMETRY OF THE RECURRENT NOVA WZ SAGITTAE AT OUTBURST

The recurrent nova WZ Sge was observed during 8 nights from 3 to 23 December 1978 (UT). The observations were made at the Ostrowik station of the Warsaw University Observatory. The 60-cm reflector was used with a conventional single-channel photometer housing an EMI 9781 photomultiplier. The variable was monitored through the B filter, with a few observations obtained through the V. BD +17°4225, with magnitudes  $V = 8^m.755$  and  $B-V = +0^m.160$  according to Krzeminski and Smak (1971), served as the comparison star. The accuracy of our observations was fairly good although influenced somewhat by the low altitude of WZ Sge above the horizon.

Alleight of our light curve are characterized by the absence of narrow minima, so they are radically different from the pre-outburst curves, for example, those of Krzeminski and Smak (1971). Only in the light curve of 3 December are the minima clearly seen, but the times of these minima are earlier by 13 minutes than predicted by the preoutburst ephemeris (Robinson et al. 1978). Up to 14 December our observations and those of Heiser and Henry (1979) show two maxima in the light curves: a higher one (primary) and a lower one (secondary) separated by a half period. Gradually with time the secondary became more clearly defined. On 13 December the two maxima were nearly equal in height. Later on the primary maxima disappeared and only the secondary could be seen, as a big hump.

We derived times of maxima from our light curves and the light curves of Heiser and Henry (1979) and used these times along with the times published by Targan (1979b) to study the period of WZ Sge. All these times (O) are listed in Table 1 along with cycle numbers (E) and residuals (O-C) computed from the preoutburst ephemeris

$$JD(\text{hel.}) = 2437547.72845 + 0^d 0566878455 \cdot E \quad (1)$$

Table 1

Date (UT)	Obs. (O)	Maxima (E)	Cycle Residuals (O-C) (Days)	Cycle (E)	Residuals (O-C) (Days)	Observer	
1978	JD(hel.)	2443800+	111000+				
3	S	46.266	108	0.065	-	B,U	
3	P	46.293	109	0.034	-	B,U	
6	P	48.503	148	0.034	-	H,H	
6	P	49.242	161	0.036	-	B,U	
6	S	49.268	161	0.062	-	B,U	
6	P	49.298	162	0.036	-	B,U	
7	P	50.261	179	0.035	-	B,U	
8	P	51.220	196	0.030	-	B,U	
8	S	51.244	196	0.054	-	B,U	
8	P	51.277	197	0.030	-	B,U	
10	P	52.526	219	0.032	-	H,H	
12	P	55.496	271	0.054	-	H,H	
13	S	55.528	271	0.086	-	H,H	
14	S	57.4767	305	0.1076	0	-0.0008	T
15	S	57.537	306	0.111	1	+0.002	H,H
15	S	58.4496	322	0.1168	17	-0.0005	T
19*	S	62.236	388	0.162	83	+0.010	B,U
19	S	62.4575	392	0.1566	87	+0.0024	T
21	S	64.171	422	0.170	117	0.000	B,U
21	S	64.228	423	0.170	118	-0.001	B,U
21	S	64.285	424	0.170	119	-0.001	B,U
22	S	65.201	440	0.179	135	0.000	B,U
23	S	65.541	446	0.179	141	-0.003	H,H
26	S	69.495	515	0.221	210	+0.002	H,H

P - Primary maximum; S - Secondary maximum; H,H - Heiser and Henry, 1979; T - Targan, 1979b; B,U - Bohusz and Udalski  
 \*-Lower weight; time of this maximum has not been used in deriving the period.

of Robinson et al. (1978). The O-C residuals are plotted versus E in Figure 1. The times of primary maxima are shown as filled circles, those of secondary as open circles. The cross denotes the maximum of Patterson quoted by Targan (1979b).

Looking at Figure 1 one should note that until about 9 December (E=111200) the period can be regarded as constant and equal to its preoutburst value. It is possible that between 6 and 8 December the period was shorter by 0.3 % though this effect may be spurious. The period increased sharply by 1% on or about 10 December (E= 111215). Thus we confirm the period increase noted first by Targan (1979a). Observations from 14 to 26 December indicate that the period remained fairly constant after the increase. The ephemeris giving the best fit to these later times of maximum is

$$JD(\text{hel.}) = 2443857.4775 + 0.057213 \cdot E' \quad (2)$$

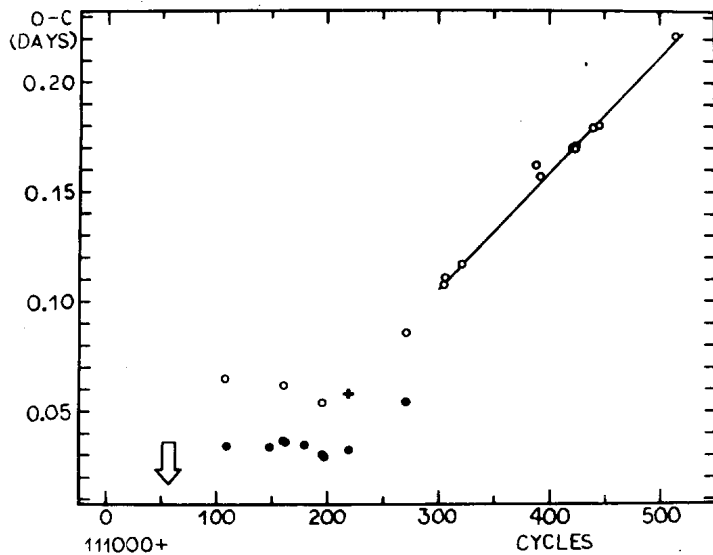


Figure 1: The (O-C) diagram for the maxima of WZ Sge calculated using ephemeris of Robinson et al. (1978). Filled and open circles refer to primary and secondary maxima, respectively. The straight line represents elements:  $JD(\text{hel})=2443857.4775+0^{\text{d}}.057213 \cdot E'$ . The cross denotes the epoch of maximum of elements given by Patterson (quoted by Targan, 1979b). The arrow indicates the beginning of outburst.

Table 1 gives also cycle number  $E'$  and residuals  $(O-C')$  computed with the above ephemeris. Our value for this new period is close to but a bit shorter than that of Targan (1979b) or that of Patterson as quoted by Targan (1979b). We suggest that the period increase might be connected with the appearance of the superhump thus implying that WZ Sge is a member of the SU UMa subclass of dwarf novae best exemplified by VW Hya (Haefner, Schoembs, Vogt, 1978).

Generally the light curves show an amplitude of about  $0^{\text{m}}.25$  in B. The composite light curve for 6,7,8 December is plotted in Figure 2. Phases in this figure are computed with the ephemeris

$$JD(\text{hel.})= 2443849.2425 + 0^{\text{d}}.056515 \cdot E'' \quad (3)$$

which best satisfies the times of maximum on those three nights.

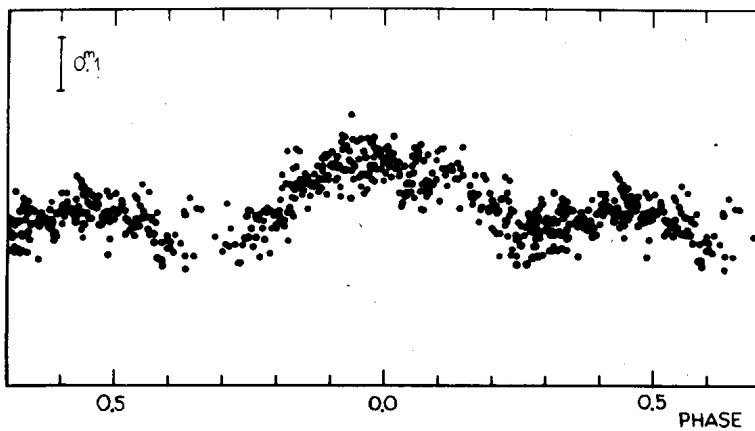


Figure 2: Composite light curve of WZ Sge assembled from nights 6,7,8 December 1978. Phase is calculated from the elements:  
 $JD(\text{hel.}) = 2443849.2425 + 0^d.056515 \cdot E$ .

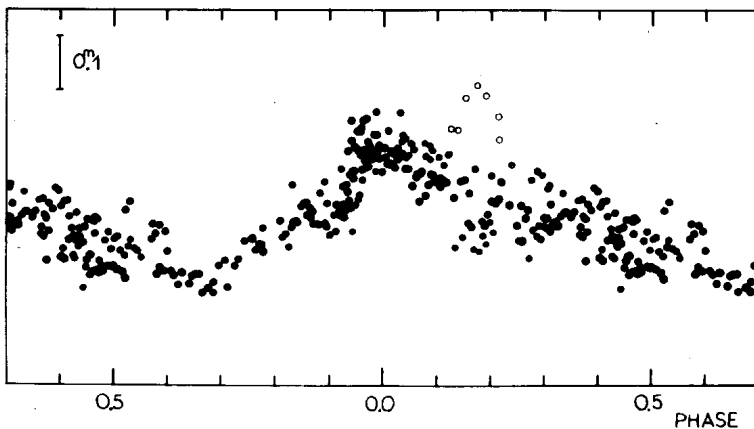


Figure 3: Composite light curve of WZ Sge assembled from nights 19,21,22 December 1978. Phase is calculated from the elements:  
 $JD(\text{hel.}) = 2443857.4775 + 0^d.057213 \cdot E$ . Maximum observed on 19 December is denoted by open circles.

Figure 3 shows the analogous curve for 19,21,22 December. Phases in this figure are computed with the elements in Equation (2) and indicate that the new period is satisfactory.

We would like to thank Dr. Whit Ludington for timely passing the information about the nova outburst and Drs. A. Kruszewski, W. Krzeminski, I. Semeniuk for their help in preparing this paper.

EWA BOHUSZ  
ANDRZEJ UDALSKI  
Warsaw University Observatory  
Al. Ujazdowskie 4  
OO-478 Warszawa, Poland

References:

- Haefner, R., Schoembs, R., Vogt, N., 1978, ESO Scientific Preprint, No. 33  
Heiser, A.M., and Henry, G.W., 1979, I.B.V.S. No. 1559  
Krzeminski, W., and Smak, J., 1971, Acta Astr., 21, 133  
Robinson, E.L., Nather, R.E., and Patterson, J., 1978, Ap.J. 219, 168  
Targan, D., 1979a, IAU Circular, No. 3320  
Targan, D., 1979b, I.B.V.S., No. 1539