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

Number 1953

Konkoly Observatory
Budapest
1981 April 13

HU ISSN 0374-0676

LIGHT CURVE VARIATION AND PERIOD BEHAVIOUR OF SW LACERTAE

SW Lac, the eclipsing binary of the W UMa type is known from the variable light curve and its period behaviour.

SW Lac was observed photoelectrically by us in the autumn 1975 and in the autumn 1980. In 1975 the observations were made with the 60 cm Cassegrain telescope of the Warsaw University Observatory in Ostrowik. In September 1980 SW Lac was observed using the 50 cm reflector of the Konkoly Observatory (Piszkéstetö Mountain Station). Moreover since October to December 1980 we observed this star with the 20 cm Zeiss refractor of the Torun Observatory in Piwnice. All the measurements were made with the Johnson BV (UBV - Konkoly Observatory) filters and reduced to the standard system. In both seasons the same comparison star was used (BD + $37^{\circ}4715$). The Kwee and van Woerden method (1956) was utilized to determine 13 moments of minima (7 primary, 6 secondary). All the observations and minima will be published in Acta Astronomica (Mikolajewska, Mikolajewski 1981).

The minima obtained by us and also all the UBV minima determined by other authors in the interval 1975-1980 were plotted in the O-C diagram (Fig.1) using the ephemeris given by Faulkner and Bookmyer (1978):

$$\text{JD HEL MIN I} = 2443459.74760 + 0^{d}.3207216 \cdot E \qquad (1)$$

The obtained results lead to the following conclusions:

1. The period of SW Lac changed suddenly probably in 1977. Two linear elements of light were determined by least squares solutions:

$$\text{JD HEL MIN I} = 2443459.74772 \pm 31 + 0^{d}.3207168 \pm 2\,E^{2} \qquad (2)$$

for the interval 1975-1977 (8 primary minima).

$$\text{JD HEL MIN I} = 2444499.52671 \pm 20 + 0^{d}.3207215 \pm 1\,E \qquad (3)$$

for the interval 1977-1980 (16 primary minima).
So the period increased by $\Delta P = 0^{d}.0000047 \pm 2$.

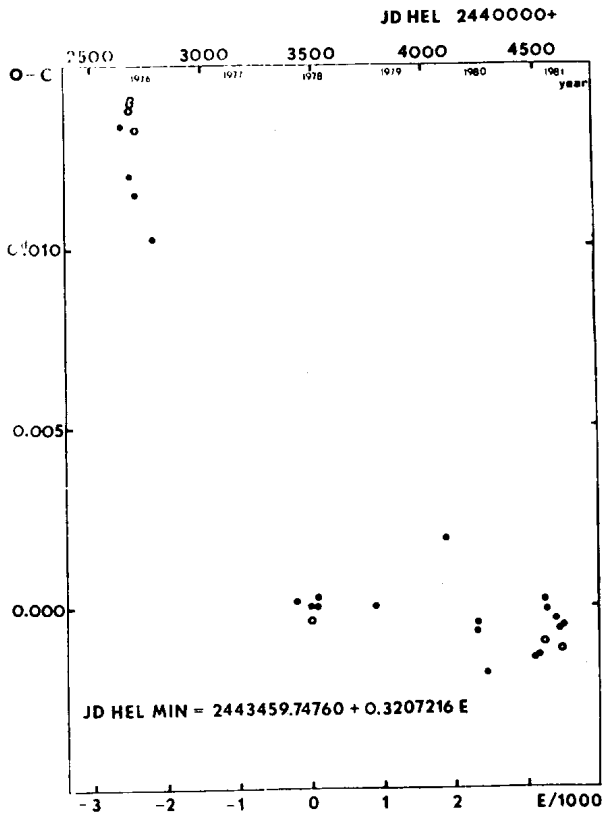

Fig.1. Recent period variation of SW Lac from UBV observations.
Times of minima are taken from: Mikolajewska, Mikolajewski 1981,

Faulkner, Bookmyer 1978, Ebersberger et al. 1978, Pohl, Gulmen 1981, Pohl, Kizilirmak 1976, Aslan et al. 1981: Dots represent the primary minima, open circles the secondary. The average error of the individual point is $0^d.0001$-$0^d.0003$.

2. The elements determined by Faulkner and Bookmyer (1978) using only 4 minima are in good agreement with the average calculated from all minima observed during 1977-1980.
3. Although there are not many minima observed during 1977-1980 it seems that the period was undergoing fluctuations around the average value given in (3).
4. Using the times of 5 primary minima obtained by us in the autumn 1980 we have determined new elements with good accuracy:

$$\text{JD HEL MIN I} = 2444499.52716 \underset{\pm 3}{} + 0^d.3207186 \underset{\pm 2}{} \cdot E \quad (4)$$

It results from the above that the period decreased again by $\Delta P = 0^d.0000029$. If it is not a temporary fluctuation of the ± 2 period, then these elements will predict epochs of minimum light in the near future.

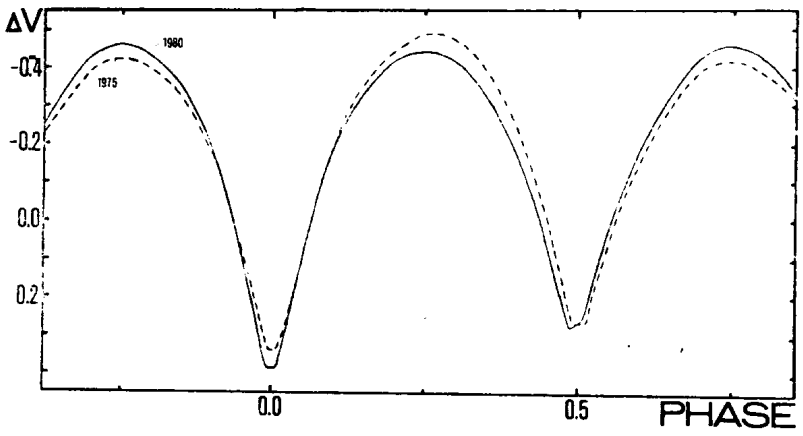

Fig.2. Schematic average V light curves of SW Lac obtained in 1975 (broken line) and 1980 (continuous line).

Fig.2 presents schematic average V light curves obtained by us in 1975 and 1980. The preliminary analysis of our observations leads to some conclusions:

1. Both curves are very asymmetric.
2. The depths of both minima were changing from night to night up to about $0^m.05$ in both seasons.
3. The mean V-brightness in 1975 and 1980 decreased by about $0^m.1$ in comparison to that in the period 1965-1969 (Ruciński 1968, Semeniuk 1971, Stępień 1980). It seems that similar changes occurred in 1953-1962 (Bookmyer 1965).
4. In 1975 the maximum following the primary minimum was higher than that following the secondary. All the prevailing observations of the V light curves and that in 1980 show the maximum following the primary minimum lower than that following the secondary, although some fluctuations of the difference in the height of maxima seem to occur (Ruciński 1968). Taking into consideration our observations and the earlier ones, one can find the periodicity of these changes amounting 10±13 years. This can be adequate to the spot activity cycle or may be caused by the drift of the spotted region on the more massive component surface.
5. The additional peculiarity of the light curve from 1975 is that the secondary minimum appears on the average later than 0.5 phase while the prevailing observations and those of 1980 show the shift of the secondary towards the preceding primary (Bookmyer 1965, Ruciński 1968). This is also visible on the O-C diagram. We have confirmed that the secondary minimum is always shifted towards the lower maximum. Bookmyer (1965) mentioned the correlation between the difference in heights of maxima and displacement of secondary minimum from phase 0.5. It is possible to explain this by the existence of dark spots on the more massive component (Binnendijk 1970).
6. The average colour indices in the extrema of the light curves are very close to those obtained by other authors and favour the hypothesis about the strong dark spot activity on the W UMa systems (Stępień 1980).

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