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**PHOTOELECTRIC OBSERVATIONS AND MINIMA TIMES OF FOUR  
W UMa SYSTEMS: LS Del, SW Lac, V839 Oph AND AQ Psc<sup>1</sup>**

During the Summer School of Young Astronomers held at Ankara University Observatory, between 22 Aug.-3 Sept. 1994, four W UMa systems: LS Del, SW Lac, V839 Oph and AQ Psc were observed in B and V filters using a single channel unrefrigerated SSP-5 photometer attached to the 30 cm Maksutov telescope. The observations were carried out by the 28 participant students (six groups in turn) and some colleagues of the Ankara University Observatory, as part of the Summer School program. The school was sponsored by The Ankara University Science Faculty, The Ankara University Graduate School of Natural and Applied Sciences, The Technical and Research Council and The Turkish Astronomical Society.

The identification and general properties of program stars are listed in Table 1, where Sp, No, T<sub>0</sub> and P stand for the spectral type of the system, number of observations obtained in each filter, epoch and orbital period used in phase calculation. Each observation comprises three five second integrations through B or V filter in sequence comparison-sky-variable-sky-variable-comparison-sky with occasional interruptions for background and check star measurements. Typical r.m.s. error of a single observation is around 0.01 mag. The control of the photometer head, data acquisition and data reduction for atmospheric extinction and heliocentric correction were carried out with a software prepared by Müyesseroğlu (1992). The light and color curves of the program stars by using the light elements from Table 1 are shown in Figures 1, 2 and 3. Part of the scatter in observations (see figures) is due to night to night light variations. The observations of AQ Psc cover only the phase interval 0.46-0.86 around secondary minimum.

Table 1. Identification and general properties of the program stars.

LS Del	SW Lac	V839 Oph	AQ Psc	
Var. Star	BD+19°4574	BD+37°4717	BD+09°3584	BD+06°0203
Comp. Star	BD+19°4568	BD+37°4715	BD+09°3578	BD+05°0177
Check Star	BD+19°4576	BD+37°4711	BD+09°3590	BD+06°0204
Sp	G5	G8V+G8V	F8V	F8V
No	132	335	379	133
T <sub>0</sub>	47790.42696	49594.4684	49590.3794	44562.4691
P	0.363840	0.3207209	0.40899532	0.47564
Reference	Demircan et al. 1991	Pena et al. 1993	Niarchos 1989	Sarma and Radhakrishnan 1982

<sup>1</sup> Paper dedicated to research assistant H. Dündar who died after ulcer operation on 25 of September 1994

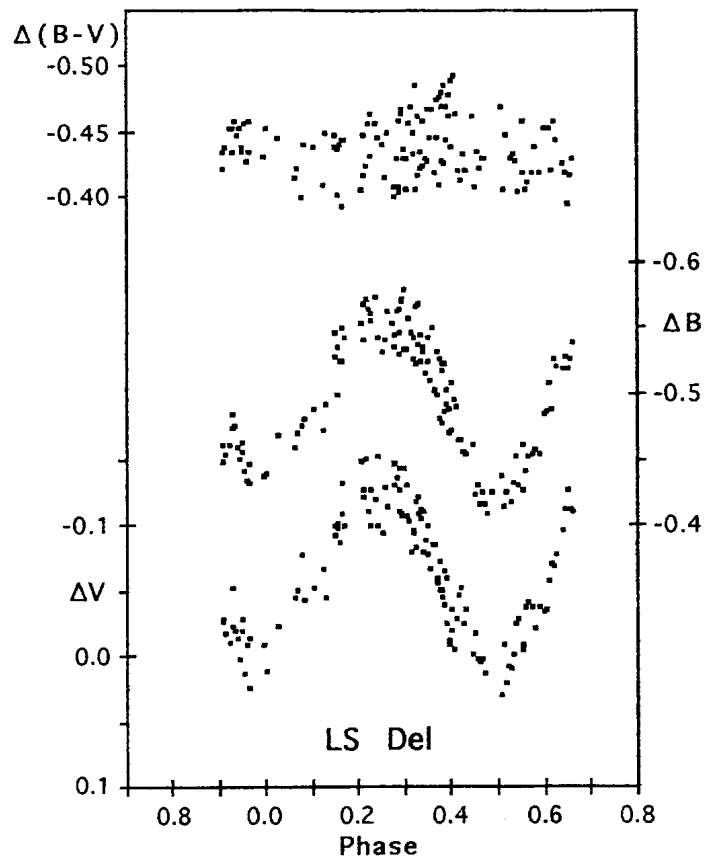


Figure 1

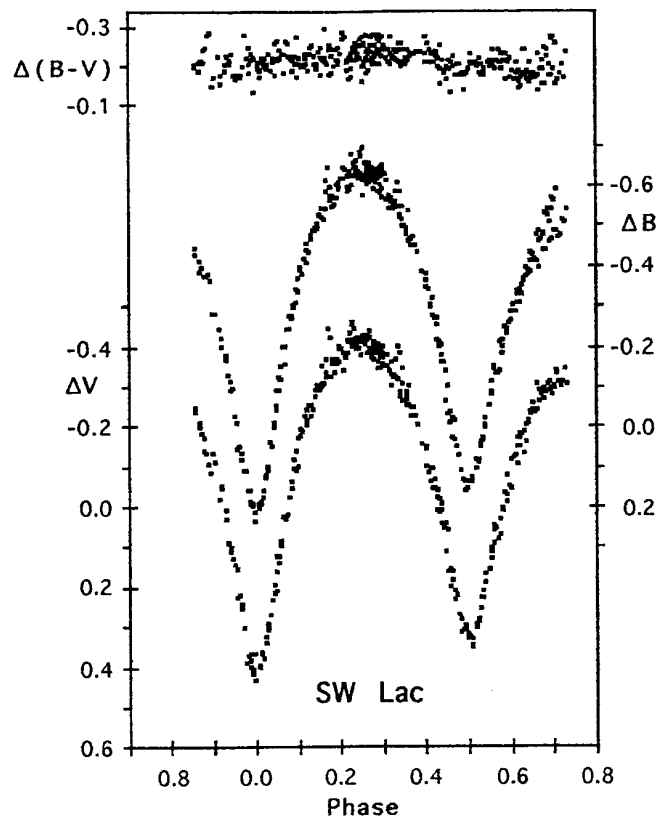


Figure 2

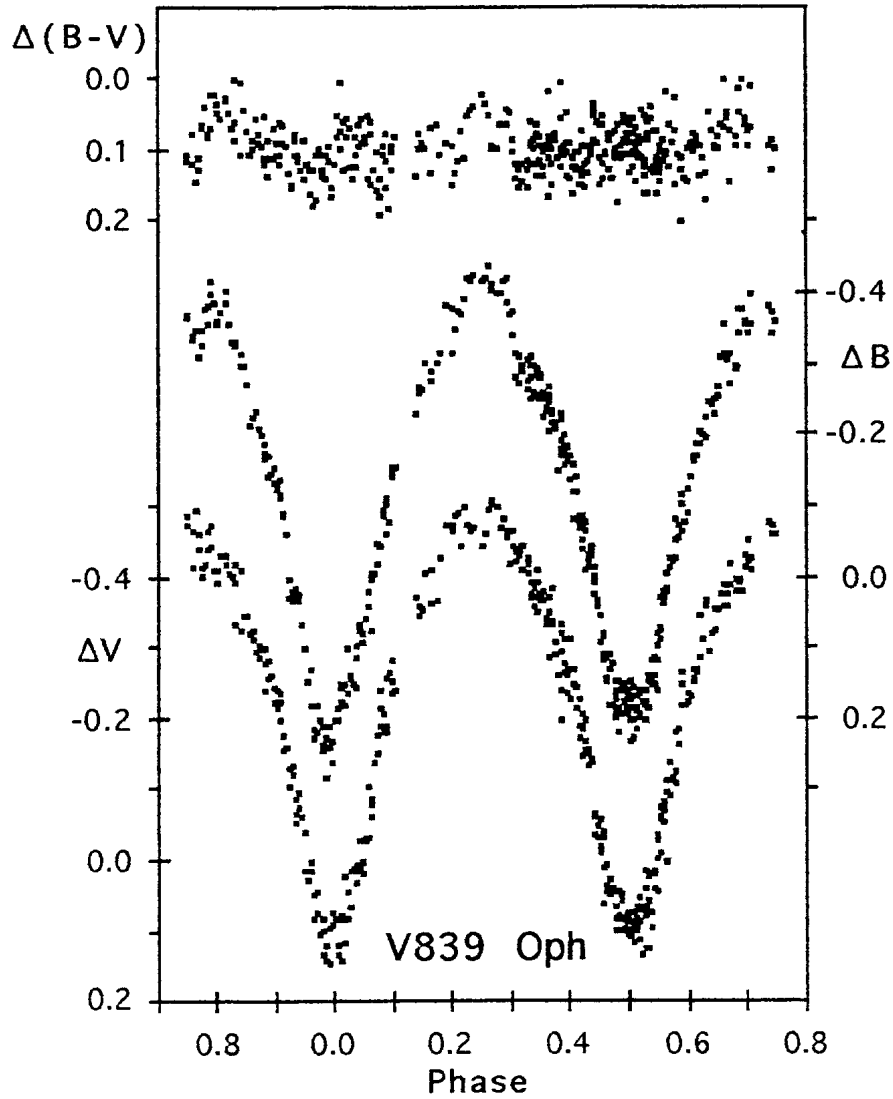


Figure 3

Table 2. Times of minima

LS Del	SW Lac	V839 Oph	AQ Psc
49588.3451 B II	49589.4973 B II	49590.3780 B I	49596.4629 B II
$\pm 0.0007$	$\pm 0.0003$	$\pm 0.0009$	$\pm 0.0009$
49588.3431 V II	49589.4989 V II	49590.3797 V I	49596.5183 V II
$\pm 0.0008$	$\pm 0.0003$	$\pm 0.0004$	$\pm 0.0006$
	49594.4696 B I	49596.3118 B II	
	$\pm 0.0003$	$\pm 0.0002$	
	49594.4674 V I	49596.3116 V II	
	$\pm 0.0003$	$\pm 0.0003$	
	49597.5156 B II	49598.3573 B II	
	$\pm 0.0003$	$\pm 0.0003$	
	49597.5159 V II	49598.3573 V II	
	$\pm 0.0003$	$\pm 0.0003$	

From these new observations 16 new times of minimum light were calculated by using the method of Kwee and Woerden (1956). The times of minimum light for the asymmetric eclipse curves of SW Lac were checked by using the well known graphical “chord” method. The resulting new times of minimum light together with their r.m.s. errors are listed in Table 2 for each system.

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