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PHOTOMETRY OF CATACLYSMIC VARIABLES. III. PHOTOMETRY OF SU UMa DURING NORMAL OUTBURST

SU UMa is a prototype of a subclass of dwarf novae. Beside normal outbursts, stars of this group undergo longer and brighter eruptions called superoutbursts. During a superoutburst periodic light variations (superhumps) appear in the light curve. They usually have an amplitude up to 0.3 mag and a period several percent longer than the orbital one.

Although SU UMa is a relatively bright dwarf nova ($V \approx 14.5$ mag at quiescence, $V \approx 12$ mag in normal outburst and $V \approx 11.3$ mag at superoutburst) very few photometric observations can be found in the literature. In particular no superhumps – one of the main properties of the SU UMa type stars – have been detected in SU UMa itself until now.

The new photometry of SU UMa was carried out on 12 December 1987 during normal outburst of the star. More than 7 hours photometric run was collected using double channel photometric system attached to the 60-cm telescope of Ostrowik Station of the Warsaw University Observatory. 11-th mag. star located 42^sE and 14'S from SU UMa served as a comparison star monitored simultaneously in the second channel. Its constancy was checked by comparison with BD 63°769 several times during the night. No variations of comparison star greater than 0.015 mag were found. Observations were obtained in white light with 20 seconds integration time.

The results were reduced in the standard way: net counts of SU UMa were divided by averaged net counts of the comparison star. Then they were crudely corrected for differential extinction and left in arbitrary units. Several measurements of SU UMa in the V filter carried out at the beginning of the observations yielded $V \approx 12.2$ mag.

Figure 1 shows the light curve of SU UMa. As it can be noted obervations were done after the maximum of brightness; the mean light level was fading with the rate of about 0.03 mag/hour. Beside that variation, brightness changes with an amplitude up to 0.2 mag and time scale of several minutes are visible. To find possible periodicities we performed Fourier analysis of the data. The computed power spectrum (in arbitrary units) is presented in Figure 2.

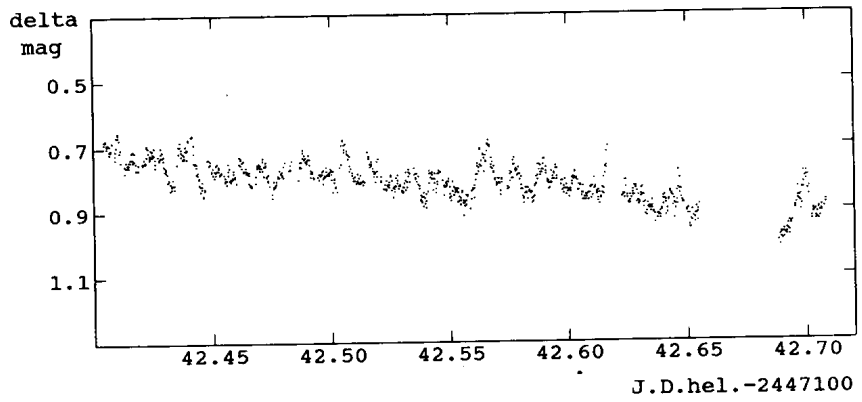

Figure 1

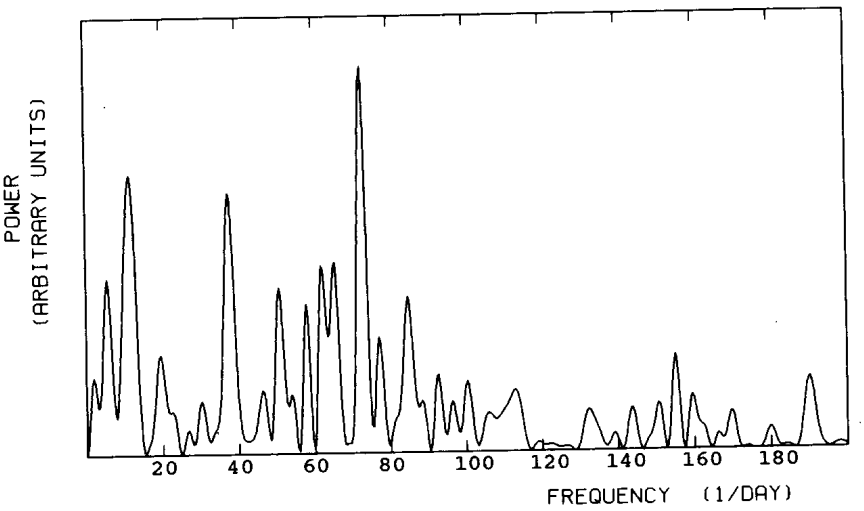

Figure 2

Period analysis can be summarized as follows:

- the nearest peak to the suspected orbital period of SU UMa (110 min – Thorstensen *et al.* 1986) corresponds to the period 124 min. Although Barwig and Schömbs (1981) found similar period (120 min ± 10%) we do not refer these variations to the orbital period. Probably moderate orbital inclination ($\approx 45°$ Thorstensen *et al.* 1986) prevents any variations of light with the orbital period.

– the most prominent peaks in the power spectrum correspond to periods equal to 19.5 and 38 min. Short time scale variations in SU UMa light curves were previously reported by Mumford (1964) (in quiescence state) and Barwig and Schömbs (1981) (in quiescence and during rise to superoutburst). Barwig and Schömbs detected period equal to 13 min, Mumford mentioned variability with the period of about $10 \div 20$ min. Present observations suggest P=38 min as a fundamental one; 19.5 min period might be interpreted as its first harmonic and the period found by Barwig and Schömbs as 1/3 P.

Among cataclysmic variables the intermediate polars reveal similar to SU UMa minutes periodicities (eg. TV Col – 32 min, AO Psc – 13 min). In these stars minutes periods are interpreted as a rotational period of the white dwarf primary. By the analogy, 38 min period of SU UMa could represent the white dwarf rotation period and the star might be classified as an intermediate polar. Relatively strong X–ray emission observed by Cordova and Mason (1983) may support this interpretation to some extend.

Although 'classic' intermediate polars do not undergo outbursts and superoutbursts, at least one object – SW UMa – shares characteristics of both intermediate polars and SU UMa type stars (Robinson *et al.* 1987). SU UMa could be the second object of such type.

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