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UBV LIGHT CURVES OF THE VERY SHORT PERIOD W UMa BINARY, GSC 03505-00677

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The star GSC 003505-00677 [RA(2000) = $16^h31^m54^s.44$, DEC(2000) = $50°21'10''.5$] was discovered to be a W UMa type binary star by Robb, Greimel, and Ouellette (1997). Their paper included an R-filtered light curve, 11 timings of minimum light and a period determination of $0^d.27897$. Its very short period and its color index of $R-I_c = 0.37$ (spectral type ~G7) qualify this system as an astrophysically important rapidly rotating solar type binary. Night to night variations and light curve asymmetries attest to this. Subsequently, the variable was selected as a target object on our recent observing run at Lowell Observatory. Our present observations were taken with the Lowell 0.79m reflecting telescope in conjunction with a thermoelectrically cooled S-13 type PMT on May 25, 26 and June 1, 1998. Standard U, B, and V filters were used. The comparison [GSC 03505-00403, RA(2000) = $16^h32^m24^s.14$, DEC(2000) = $50°21'33''.4$], and check stars, [GSC 03505-00185, RA(2000) = $16^h32^m36^s.88$, DEC(2000) = $50°20'52''.8$] are given C, and K in Figure 1 along with the variable, V. Some 200 observations were taken in each pass band of this 13th magnitude binary. Five mean epochs of minimum light were determined from the observations made during three primary and two secondary eclipses by DF using the Hertzsprung technique (1928). These precision epochs of minimum light are given in Table 1 along with their standard errors in parentheses. A precision linear ephemeris was calculated, using the available 16 timings of minimum light:

$$\text{J.D. Hel Min I} = 2450633^d.9493(2) + 0.27895803(31) \times E. \quad (1)$$

The O−C residuals for all published observations are shown graphically in Figure 2 and our timings are listed in Table 1. These light elements were also used to phase our present observations.

The UBV light curves and the B−V and U−B color curves of the variable are shown as Figure 3 as differential standard magnitudes (variable−comparison) versus phase. The probable error of a single observation was 0.9% in B, 1.3% in V and 1.9% in U. The analysis of the light curves is underway.

Table 1: Epochs of Minimum Light, GSC 03505-00677

JD Hel. 2450000+	Min	Cycles	O−C
960.8880(3)	I	1172.0	−0.0001
961.7235(4)	I	1175.0	−0.0015
961.8652(5)	II	1175.5	0.0007
966.7466(11)	I	1193.0	0.0003
966.8862(5)	II	1193.5	0.0005

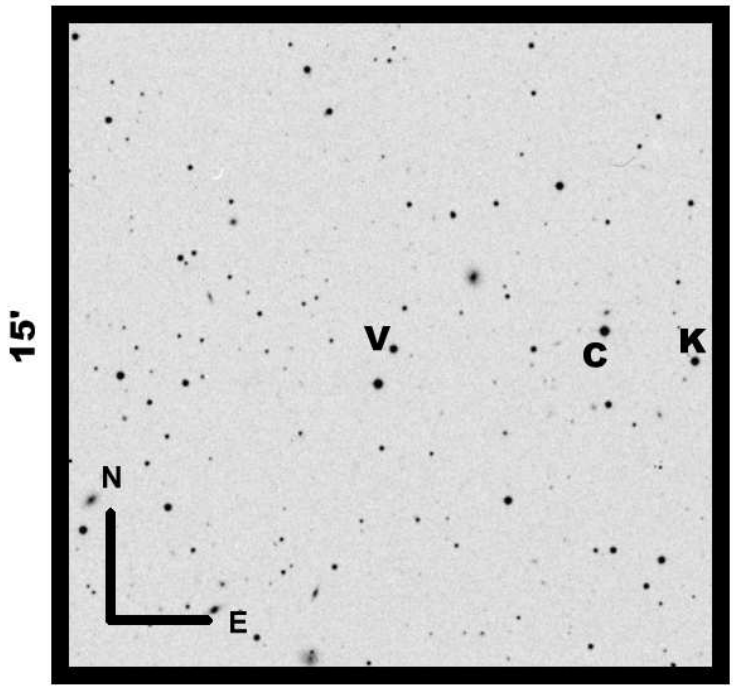

Figure 1. Finding chart (modified from the Digital Sky Survey image) of the Variable, GSC 03505-00677, V, the comparison star, C, and the check star, K.

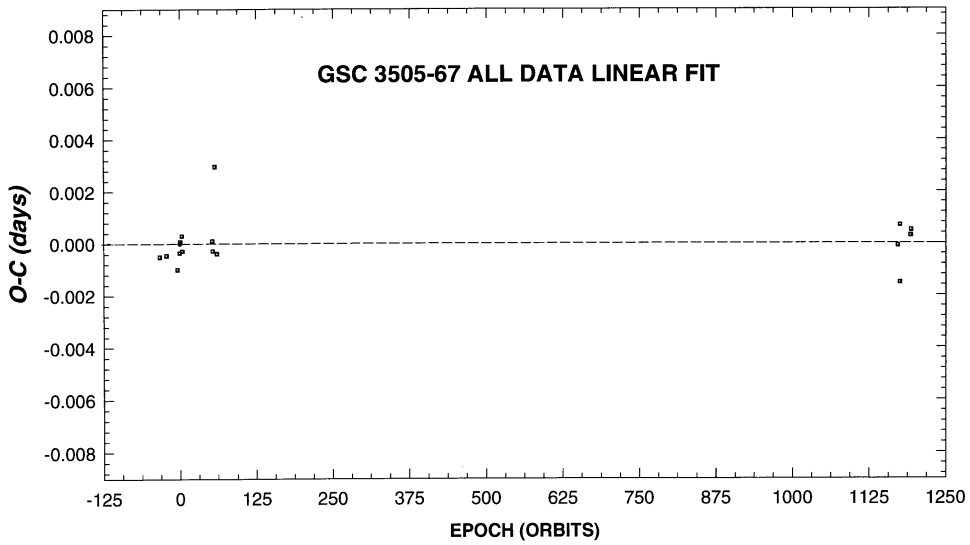

Figure 2. O−C residuals for all available timings of minimum light as calculated from the improved ephemeris.

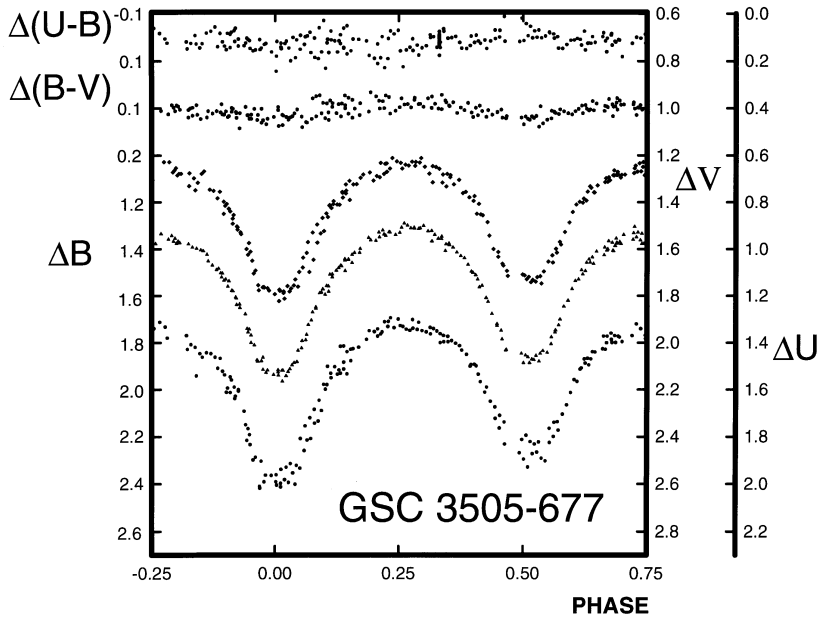

Figure 3. U, B, V light curves and U−B, B−V color curves for GSC 03505-00677 as magnitude differences, variable minus comparison star.

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