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THE SHORT-PERIOD ECLIPSING BINARY GSC 3123.1618

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Variability of the star GSC 3123-1618 = ROTSE1 J185538.25+405859.0 was detected by the ROTSE1 CCD survey (Akerlof et al. 2000). Blättler and Diethelm (2000) presented an unfiltered light curve and found a period of 0^d.2559007. Our CCD photometry during the same observing season produced a *V*-band light curve and improved light elements.

Billings observed in the *V* band with a 0.35-m Schmidt–Cassegrain telescope and Apogee AP-7 CCD. Kaiser observed in *VRI* with a 0.35-m Schmidt–Cassegrain and SBIG ST-9E CCD. Terrell observed in *B* with a 0.60-m Cassegrain and SBIG ST-8 CCD at the Sommers–Bausch Observatory of the University of Colorado. Henden observed with the 1.0-m Ritchey–Chrétien telescope of the U. S. Naval Observatory, Flagstaff Station with a Tektronix/SITe 1024 × 1024 thinned, backside–illuminated CCD and *BVR_cI_c* filters. His photometry of the variable near maximum light and of the comparison and check stars is shown in Table 1 (photometry for other stars in the field can be found in Henden 2001). Henden also used the USNO-A2.0 astrometric catalog to determine the precise position for GSC 3123-1618 of 18^h55^m38^s.20, +40°58′57″.06 (J2000).

Altogether, we obtained timings of 7 primary and 3 secondary minima (Table 2). Times of minima were determined with the computer program AVE (Barbera 2000) based on the Kwee–Van Woerden (1956) method. In addition to the 10 new minima reported here, we have included 5 minima timings published recently by Blättler (2000). A least-squares solution of the 15 timings resulted in the following light elements:

$$\text{Min. I} = \text{HJD } 2451766.5840 + 0^{\text{d}}.2559067 \times E. \\ \pm 0.0001 \pm 0.0000001$$

Henden observed on two nights, at phase 0.70, *V* = 13.444 and phase 0.26, *V* = 13.434. We adopt the average of the two as the magnitude at maximum, 13.439 *V*. Differential measurements yield 14.61 *V* in primary minimum and 14.22 *V* in secondary minimum. The *V*-band light curve is shown in Figure 1. Terrell used the latest version of the Wilson–Devinney program (Wilson and Devinney 1971, Wilson 1979) to explore preliminary solutions for the system parameters. As expected for a light curve with partial eclipses, the mass ratio could not be determined. A grid of solutions at fixed values (0.5 to 1.5) of the mass ratio showed very little variation in the goodness of fit. Until the mass

Table 1: BVR_cI_c photometry with errors less than 0^m02 , GSC 3123.1618, comparison and check stars

Star	GSC	V	$B - V$	$V - R_c$	$R_c - I_c$
variable (max)	3123:1618	13.439	0.990	0.602	0.556
comparison	3123:0834	13.938	1.074	0.584	0.479
check	3123:0596	13.694	0.671	0.372	0.331

Table 2: Times of minima, GSC 3123.1618

HJD 2400000 +	Error \pm	Epoch	$O - C$	Observer	Type
51721.6729	0.0003	-175.5	+0.0005	Kaiser	ccd - V filter
51722.8238	0.0001	-171.0	-0.0002	Billings	ccd - V filter
51732.8043	0.0001	-132.0	0.0000	Billings	ccd - V filter
51739.8413	0.0002	-104.5	-0.0004	Billings	ccd - V filter
51741.7610	0.0001	-97.0	-0.0001	Kaiser	ccd - V filter
51756.7314	0.0005	-38.5	-0.0002	Terrell	ccd - B filter
51756.8594	0.0002	-38.0	-0.0001	Terrell	ccd - B filter
51766.4559	0.0005	-0.5	-0.0001	Blättler	ccd - unfiltered
51766.5841	0.0005	0.0	+0.0001	Blättler	ccd - unfiltered
51771.4464	0.0006	+19	+0.0002	Blättler	ccd - unfiltered
51781.4271	0.0010	+58.0	+0.0005	Blättler	ccd - unfiltered
51781.5543	0.0015	+58.5	-0.0002	Blättler	ccd - unfiltered
51790.6392	0.0001	+94.0	0.0000	Kaiser	ccd - V filter
51864.5962	0.0001	+383	-0.0001	Billings	ccd - V filter
51867.6670	0.0001	395	0.0001	Billings	ccd - V filter

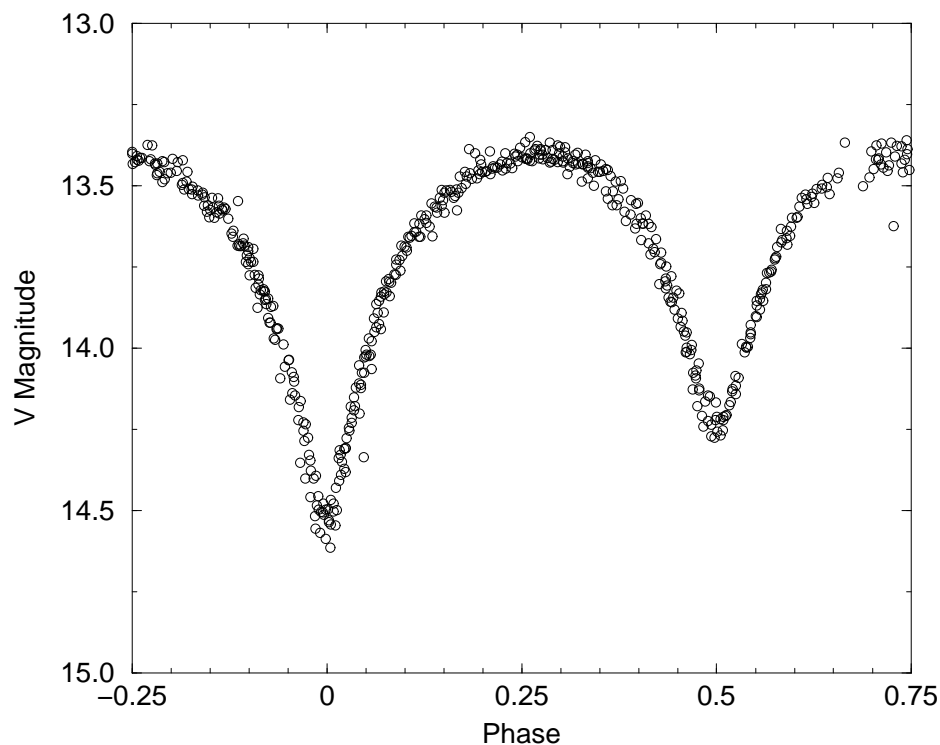


Figure 1. Phased light curve, GSC 3123.1618 – V filter

ratio can be determined by spectroscopic observations, we cannot make any definitive claims about the nature of the system. However, our solutions indicate that the system is in weak or broken contact.

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References:

- Akerlof, C., et al., 2000, *AJ*, **119**, 1901
 Blättler, E., and Diethelm, R., 2000, *IBVS*, No. 4985
 Blättler, E., 2000, *BBSAG Bull.*, No. 123
 Barbera, R., 2000, <http://www.astrogea.org/soft/ave/aveint.htm>
 Henden, A., 2001,
 <ftp://ftp.nofs.navy.mil/pub/outgoing/aah/sequence/gsc3123.dat>
 Kwee, K.K., and Van Woerden, H., 1956, *BAN*, **12**, No. 464, 327
 Wilson, R.E., 1979, *ApJ*, **234**, 1054
 Wilson, R.E. and Devinney, E.J., 1971, *ApJ*, **166**, 605