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GSC 4288-186: A NEW ECCENTRIC BINARY

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During a campaign of photometry on XX Cep in the summer of 2002, one of the stars in the field was discovered to be variable by VB. We observed the star at the Çanakkale Onsekiz Mart University's Ulupinar Astrophysics Observatory (ÇOMU UAO) (latitude, $40^\circ 06' 01''$ North, longitude, $01^h 45^m 54^s$ East, altitude, 410 m). We made the measurements with a 30 cm Meade LX200 Schmidt-Cassegrain telescope at f/10 and f/3.3, and using an SBIG ST-237 CCD Camera without filters. Exposure times ranged from 6 to 10 seconds.

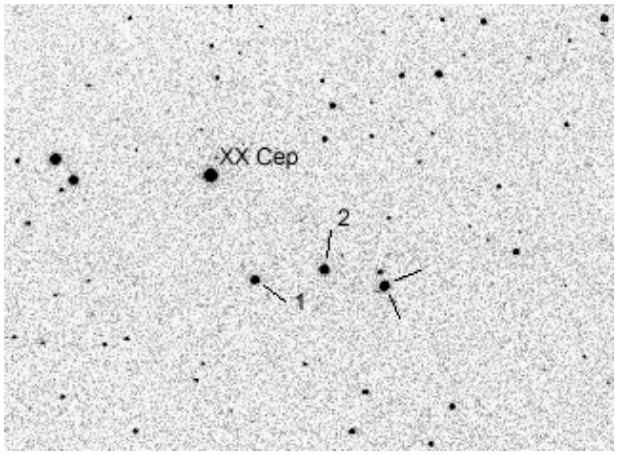

Figure 1. Identification map of GSC 4288-0186 (bars), comparison star (No. 1) and check star (No. 2). The size of the field is $16.6' \times 12.5'$, unfiltered CCD band, 6-seconds exposure.

The star has been observed over 20 nights to confirm the variability and determine the period. The Julian dates of observations (+2452000) are 515, 535, 536, 537, 538, 539, 540, 551, 552, 553, 555, 571, 575, 576, 577, 579, 591, 593, 594, 602. Catalogue information for the variable, comparison and check stars are given in Table 1. We show the finding chart for the observed stars in Figure 1.

CCD images were processed by the MUNIDOS photometry software package (Hroch, 1997). Our differential magnitudes are calculated in the sense of star minus GSC 4288-0241. Times of minima of the star were first found using the method of Kwee- van Woerden (1956) and, depending on the nature of the data set, by the Taranis programme, which is

Table 1: Stars observed in the field of GSC 4288-0186

Type	Star's GSC Id	R.A. J2000	Dec. J2000
Variable	0186	$23^h37^m43^s.30$	$64°18'11''.6$
Comparison	0241	$23^h38^m09^s.00$	$64°17'56''.6$
Check	0100	$23^h37^m55^s.57$	$64°18'22''.3$

Table 2: Times of Minimum Light −2400000

HJD	Error	Type
52515.4800	0.0045	II
52591.2761	0.0001	I
52594.3713	0.0014	II

based on an artificial neural network (Gaspani, 1995). The times of minima, with their uncertainties, are presented in Table 2. From these times of minimum light we find the ephemeris to be:

$$\text{HJD of Primary Minimum} = 2452591.2761(1)+5^d.63508(2)\times\text{E}.$$

where the uncertainties in the final digit are given in brackets In Figure 2, the differential unfiltered magnitudes phased at this period are plotted.

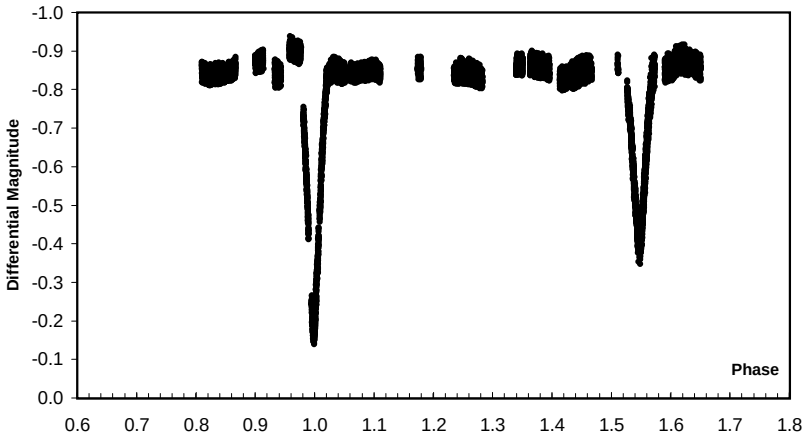

Figure 2. Unfiltered light curve of GSC 4288-0186.

Some of our initial raw data were compromised by moonlight, which introduced non-linearities into the measurements. As well, the broad bandwidth of the unfiltered observations can introduce other non-linearities into the magnitude comparison process, especially with larger air masses (cf., e.g. Golay, 1974). These facts should be kept in mind in relation to the apparent out of eclipse variation.

While a definitive model for the system has not been attempted at this stage, there exist physically plausible parameters which fit the data. For light curve modelling we used `ILOT` (Banks, T. & Budding, E., 1990). From the spectral class, we assume a temperature

for the hot star of 8100 K and we have then used standard theoretical values for the limb darkening, gravity brightening and effective albedo coefficients given this temperature and effective wavelength (cf. e.g. Budding, 1993). The wavelength-independent parameters we found are: the radius, relative to the mean separation, of the hot star is 0.085 ± 0.007, that of the cool star is 0.081 ± 0.006, orbital inclination $88^\circ \pm 0\overset{\circ}{.}5$, eccentricity of the orbit 0.075 ± 0.01 and longitude of the periastron $\varpi = 25^\circ \pm 1^\circ$. The well separated stars make the mass ratio photometrically indeterminate, so we assumed a value of 0.78, consistent with the temperature difference for a Main Sequence model, given the respective luminosities. This well separated model is then reasonably self-consistent in temperature difference, mass ratio and ratio of the radii with a A5V+A7V Main Sequence eclipsing binary system.

This type of modelling has proved effective in locating optimal eccentricity and orientation parameters for well detached systems like this. It will be interesting to check for secular variations of the latter parameter (ϖ) in future years.

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ERRATUM FOR IBVS 5381

Errata for the paper IBVS No. 5381 titled *"GSC 4288-186: a New Eccentric Binary"*: Minima times reported as

52515.4800	II
52591.2761	I
52594.3713	II

should be changed as

52515.4840	II
52591.2817	I
52594.3767	II

Volkan Bakis