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New spectroscopic observations of the semidetached binary V375 Cas

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Abstract. We present the low resolution (R∼5099) spectroscopy of the eclipsing binary V375 Cas (TIC 326630342) in this study. The low resolution spectroscopic observations of the system were made at the TUBITAK National Observatory using a TFOSC spectrograph in 2020 and 2021. For measuring the radial velocities of both components of the eclipsing binary Gaussian fitting method was used. According to Keplerian orbital solution the spectroscopic mass ratio of the close binary was determined as 0.626 ± 0.098. The best fitting orbital elements are $a_1 \sin i = 0.0243 \pm 0.0018$ au, $a_2 \sin i = 0.0351 \pm 0.0018$ au, $M_1 \sin^3 i = 7.06 \pm 0.87$ $M_\odot$ and $M_2 \sin^3 i = 4.42 \pm 0.75$ $M_\odot$.

Key words: binary stars – spectrocopic observations – V375 Cas

1. Introduction

V375 Cas (= GSC 04285 00577; TIC 326630342) is a relatively faint (V∼ 10.1 mag) massive semidetached B2V type binary. It was first discovered by Weber (1958). Brancewicz & Dworak (1980) listed some parameters of V375 Cas such as its spectral type B3; $T_1 = 14\,220$ K; $T_2 = 11\,450$ K; $M_1 = 9.25$ $M_\odot$, mass ratio q = 0.61, and classified it as a β Lyrae type binary. Li et al. (2022) observed the system on 2021 February 7 with the 2.16 m telescope at Xinglong Station of National Astronomical Observatories (Chinese Academy of Sciences) and gave the spectral type of V375 Cas to be B2. In this study we aimed to present the preliminary results obtained from new spectroscopic observations of V375 Cas.

2. Spectroscopic observations

Spectroscopic observations of V375 Cas were made at the TUBITAK National Observatory in 2020 and 2021 using TFOSC (TUG Faint Object Spectrograph

and Camera) and a 2048 x 2048 Andor iKon-L 936 CCD camera attached to the 1.5 m telescope (RTT 150). Grism number 9 with a slit width of 10.68 arcsec which has a spectral coverage of 335 – 940 nm was used. The exposure time was 2400 s.

A total of 12 spectra of V375 Cas have been collected during observing programme. For all observations an iron–argon lamp was used for wavelength calibration. Halogen lamp spectra for flat fielding were also taken every night. We used the IRAF[1] package to reduce the spectroscopic images and to extract the spectrum.

3. Radial velocities and orbital solution

Radial velocities (RVs) of both components of V375 Cas were measured using Gaussian fitting of selected spectral line. According to the B2 V spectral type of the system there should be strong neutral He lines in the observed spectra. But we used H alpha line (656.28 nm) because the secondary star's spectral lines could be clearly detected (see Fig. 1).

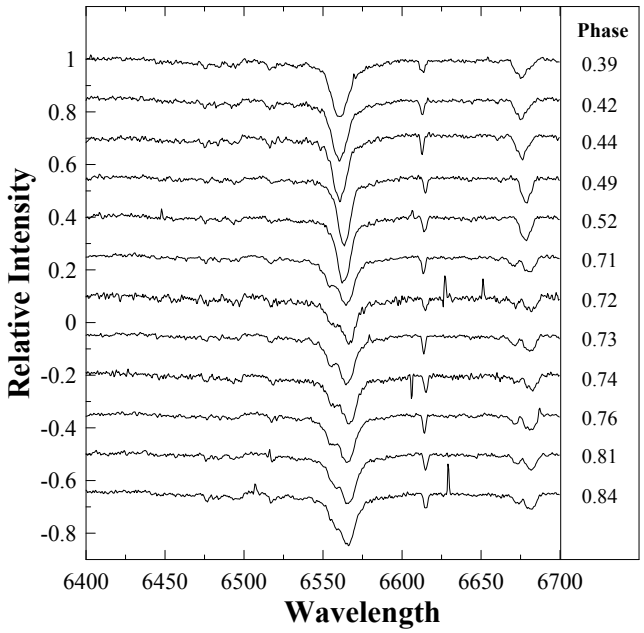

Figure 1. Hydrogen alpha lines of primary and secondary components of V375 Cas.

[1]IRAF is distributed by the National Optical Astronomical Observatories, operated by the Association of the Universities for Research in Astronomy, Inc under coop erative agreement with the National Science Foundation.

Using the least square method for best curve fitting the orbital parameters were obtained. The best fitted orbital elements we derived are given in Table 1. Fig. 2 shows the best theoretical fit to the radial velocity curves of the system

Table 1. Spectroscopic orbital parameters of V375 Cas.

Parameter	Value
P (days)	1.47344 (constant)
T_0 (HJD+2452501)	0.1930 ± 0.0192
e	0.0 (assumed)
K_1 (km/s)	162.9 ± 11.1
K_2 (km/s)	260.3 ± 44.2
q	0.626 ± 0.098
V_γ (km/s)	-19.3 ± 8.6
$M_1 \sin^3 i$	7.06 ± 0.87
$M_2 \sin^3 i$	4.42 ± 0.75
$a_1 \sin i$	0.0243 ± 0.0018
$a_2 \sin i$	0.0351 ± 0.0025

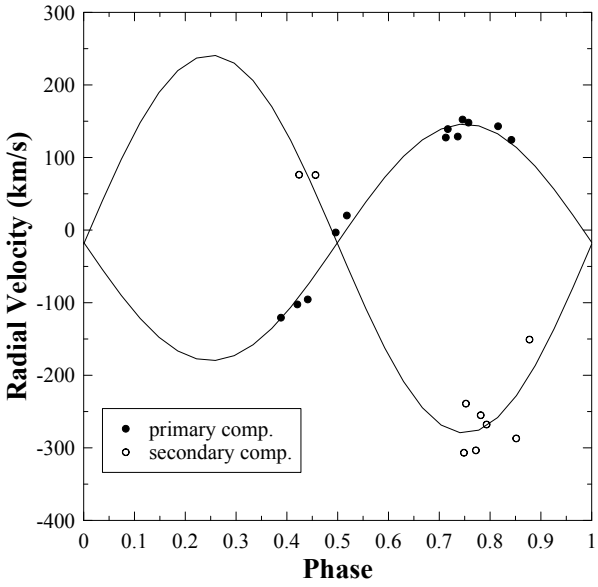

Figure 2. Best theoretical fit to the radial velocity curves of V375 Cas with a Keplerian orbit (continuous line).

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