Contrib. Astron. Obs. Skalnaté Pleso **50**, 635 – 636, (2020)
https://doi.org/10.31577/caosp.2020.50.2.635

Apsidal motion in α CrB

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Received: October 31, 2019; Accepted: November 14, 2019

Abstract. We present a new derivation of apsidal motion in the well known eclipsing eccentric binary α CrB.

1. Introduction

The eclipsing binary α CrB ($P = 17\overset{\mathrm{d}}{.}36$, $V = 2\overset{\mathrm{m}}{.}21$, $e = 0.33$, Sp A0 V + G7 V) was identified as a spectrscopic binary (Hartmann, 1903) more than 100 years ago. The star was one of the objects in pioneering electrophotometric observations by J. Stebbins, Stebbins (1928), who discovered a shallow $0\overset{\mathrm{m}}{.}1$ primary minimum in 1912. The secondary minimum, when a faint red companion is eclipsed by the bright A0 star, was not detected but later found with a red-sensitive photocell by Kron & Gordon (1953). The next observations of the secondary minimum, necessary to measure the rate of apsidal motion, were by Volkov (1993). That value was later corrected in Volkov (2005) from Schmitt (1998) X-ray observations. Problems related to the observed rate of apsidal rotation to its theoretical value were discussed in Volkov (2015).

2. Apsidal motion

We performed new observations of the system in 2009–2019 and have built one mean primary and one mean secondary minimum, see Fig. 1 so as to find a new value of the periastron advance rate: $\dot{\omega}_{obs} = 0\overset{\circ}{.}16(3)\,\mathrm{yr}^{-1}$, $U = 23000 \pm 4000$ years.

We have the most accurate value of the apsidal rotation speed in α CrB to date. To improve the value, it is necessary to get more precise orbital elements by continuing photometric observations, especially in the secondary minimum.

Acknowledgements. This study was partly supported by RNF grant 14-12-00146, RFBR grant 18-502-12025 and a scholarship of the Slovak Academic Information Agency(SAIA). The author acknowledges support from the Program of Development of M.V. Lomonosov Moscow State University (Leading Scientific School 'Physics of

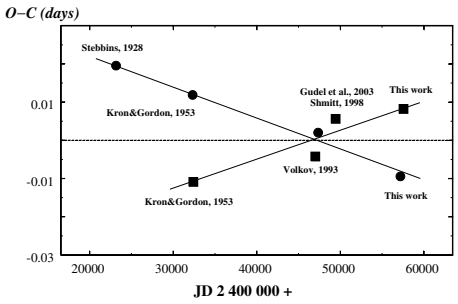

Figure 1. The ETV diagram of the system built with the mean value of $P1$ and $P2$. One more X-ray timing by Güdel et al. (2003) blends with the Schmitt (1998) point. The errors of secondary minima timings (squares) are 5 minutes, and those of the primaries (circles) are 3 minutes.

stars, relativistic objects and galaxies'). In our observations we used the 60-cm Zeiss-600 reflector of INASAN Simeiz Observatory and the 60-cm Zeiss-600 of near Moscow Zvenigorod Observatory.

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