CzeV843 Cen – false-candidate for RR Lyrae star in gravitationally bound visual binary system

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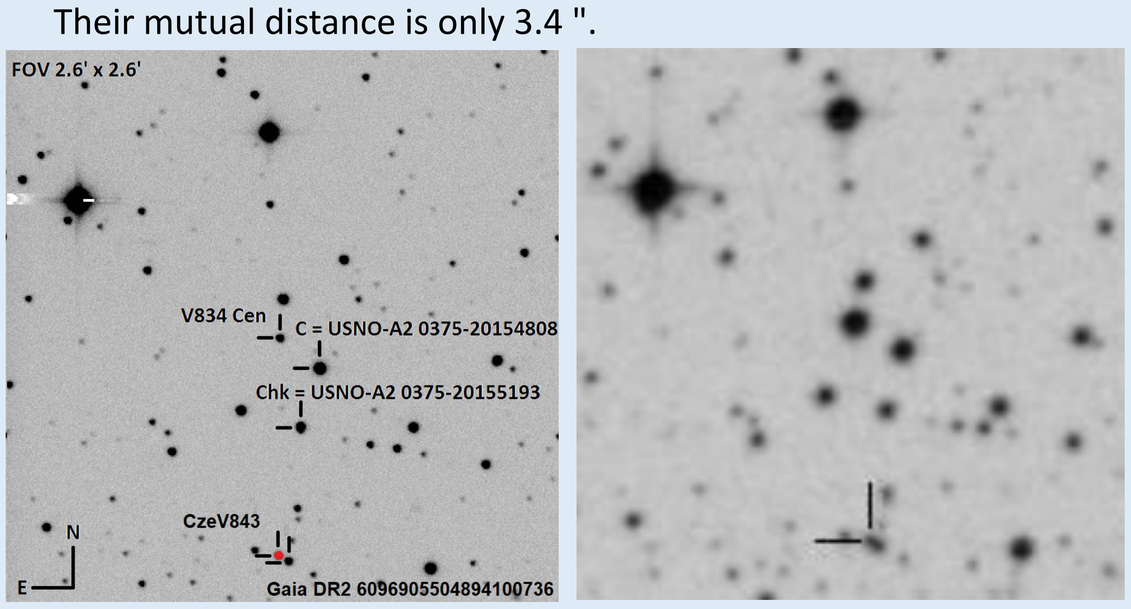
Abstract

Competition in searching of RR Lyrae star in the proper, gravitationally bound binary system continues. CzeV843 Cen is a recently discovered pulsating variable star of RR Lyrae type with uncertain period, which is in close vicinity (3.4 arcsec) to another star with similar brightness. This pair of stars serves as a possible candidate on well-detached binary system with an RR Lyr component. This study deals with available data for this object. Photometric measurements for CzeV843 from ASAS-SN database allowed to determine pulsation period of 0.65366 d. Unfortunately, Gaia DR2 results show different distances of both stars from visual pair (4200 or 940 pc) which means only optical double star.

Introduction

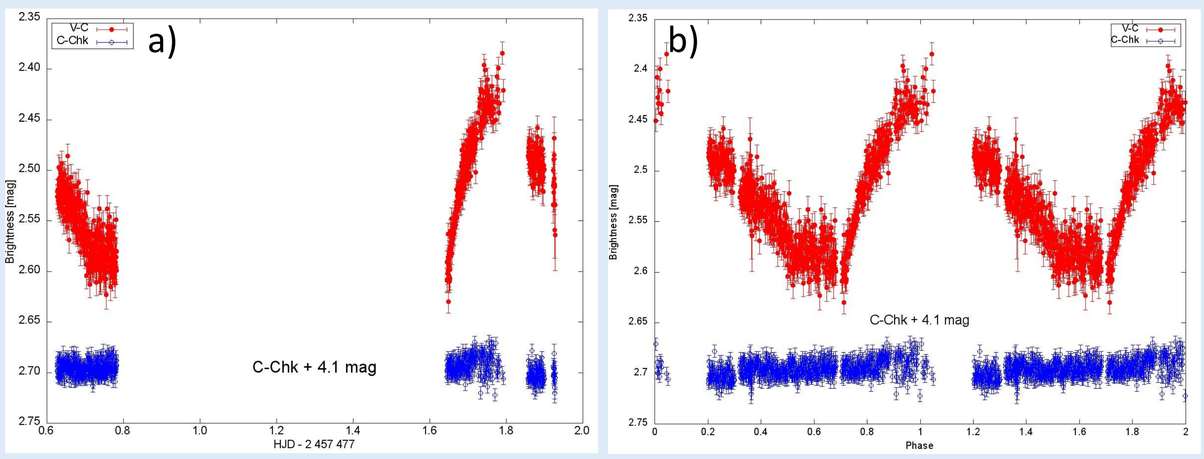
Variable star CzeV843 Cen (Gaia DR2 6096905504888889216)

- Variability was identified on CCD *R*-band images from Danish 1.54-m telescope (Dk154) at La Silla, Chile in 31st March 2016 (Liška, Janík, & Zejda, 2016).
- Good angular resolution (0.4 "/pix) and seeing around 1 " in Dk154 allowed to resolve CzeV843 (17.39 mag, *g*-band) and star Gaia DR2 6096905504894100736 with similar brightness (17.10 mag, *g*-band). Their mutual distance is only 3.4 ".



Close vicinity of CzeV843 - R-band image from Dk154 (left) or POSS2/UKSTU Red image from the STScI Digitized Sky Survey for comparison (right).

- Observations were held only in two nights – not enough for clear type variability determination and period analysis.
- Preliminary type was estimated on RR Lyrae (RRab) with possible pulsating period of 0.43 or 0.64 d.



a) Differential photometry for CzeV843 Cen and check star from Dk154 telescope (R-band), b) data phased with one of the possible periods of 0.427 d.

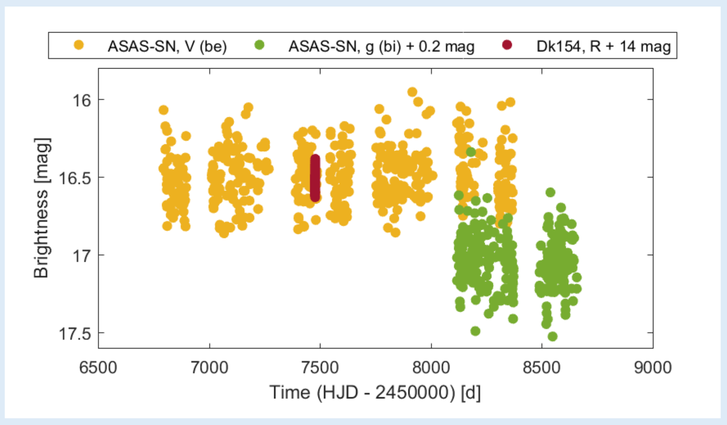
Summary in Liška, Janík, & Zejda (2016) and Skarka et al. (2017).

Binaries with an RR Lyrae component

- Recently, around 200 000 variable stars of RR Lyrae type are known.
- Almost 200 candidates on binary system with an RR Lyrae component exist (RRLyrBinCan database, Liška & Skarka, 2016). Only TU UMa looks as the proper binary system containing an RR Lyr component.
- Only several candidates based on astrometry (visual binary, anomalies in proper motion, etc.) were proposed e.g. Kervella et al., 2019 (a,b).

New analysis of CzeV843

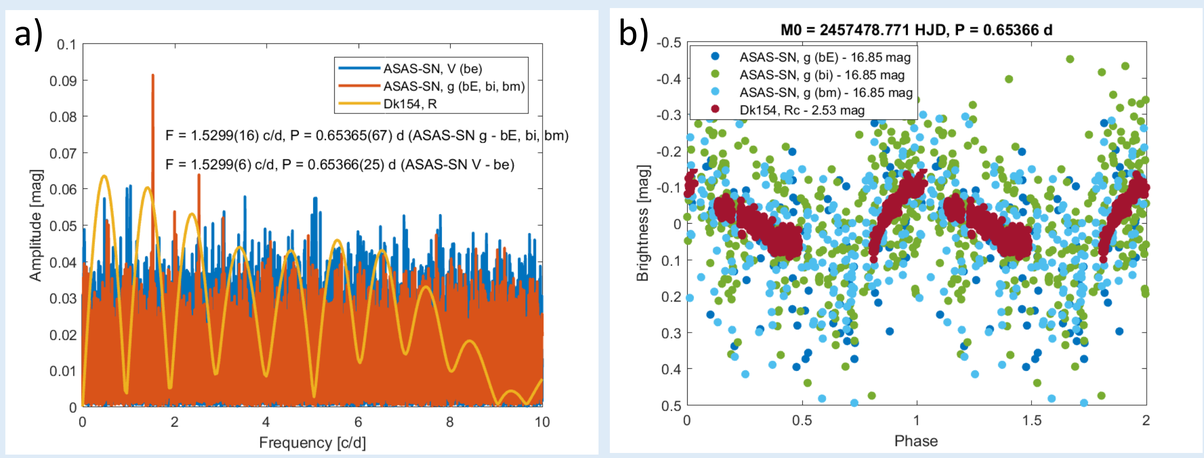
- Available *V*- and *g*-band data in ASAS-SN database (Kochanek et al, 2017) suffer low resolution (8 "/pix). Signal for CzeV843 is contaminated by several nearby stars. However, the long-term photometry is big benefit of this dataset.



Light changes of CzeV843 based on data from Dk154 telescope and ASAS-SN project.

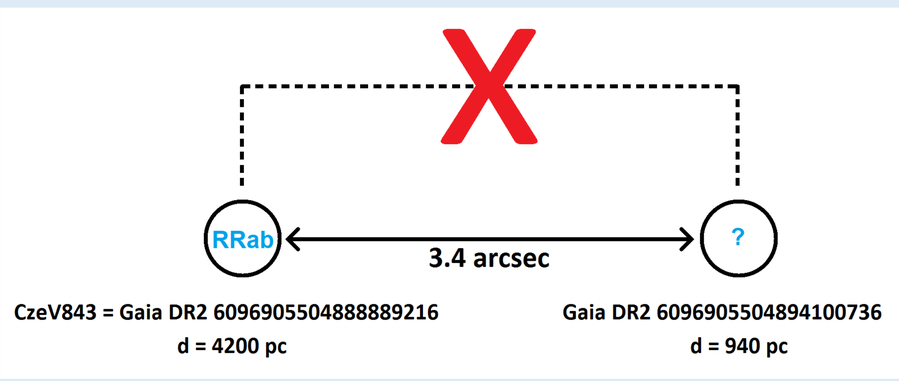
- Frequency analysis (Period04) showed the strongest period of 0.65366 d. Type of variability was confirmed as RRab.

$$JD_{max} = 2457478.771\ (HJD) + 0.65366\ (d) \times E \qquad (1)$$



a) Frequency spectrum (Period04), b) light changes of CzeV843 phased with ephemeris in eq (1).

Parameter	Value for CzeV843 (accepted in VSX)
Other name	Gaia DR2 6096905504888889216
GAIA DR2 coordinates (RA, DEC)	14:09:07.12 -45:18:18.0
Variability type	RR Lyr (RRab)
Maximum magnitude	17.5 mag (*V* – Johnson)
Amplitude	0.3: mag (R_c – Cousins)



Astrometric results from Gaia DR2 (Bailer-Jones et al., 2018).

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