

# DATABASE OF CANDIDATES FOR RR LYRAE STARS IN BINARY SYSTEMS RRLYRBINCAN



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## Abstract

A new online database with RR Lyrae stars bound in binary systems is presented. Its purpose is to give a quick overview about known and suspected RR Lyrae stars in binaries on the basis of available literature. The first released version of the catalogue contains information about 61 double-star candidates, their orbital periods, method of detection, comments and active links to published papers.

## 1 Introduction

Revelation of RR Lyrae stars bound in binary systems belongs among highly complicated observing tasks. Since the sixties of the 20<sup>th</sup> century several observing groups have tried to succeed in it. Many objects were marked as candidates for such systems. Unfortunately, only some of them were subsequently studied in detail to prove or disprove their observed behaviour. The rapidly growing number of candidates in last years (e.g. Li & Qian 2014; Hajdu et al. 2015) motivated us to prepare catalogue of the candidates for binary systems with RR Lyrae component which should help with identification of this astrophysically important class of binaries. The list together with the overview is included into the publication Liška et al. (2015).

## 2 Database structure

The list with known candidates of binaries, which is included in the main table, was created using available literature. The table contains official name of the object, its coordinates, magnitude range (preferably in available *V*-magnitudes), comments on the presence of the Blazhko effect, type of pulsator (RRab, RRc), orbital period, methods which were used for detection, or study of the binarity, reference with link to NASA ADS web page and, finally, comments (see Fig. 1).

We give also the second table with stars which are blends, or other disproved candidates for binarity.

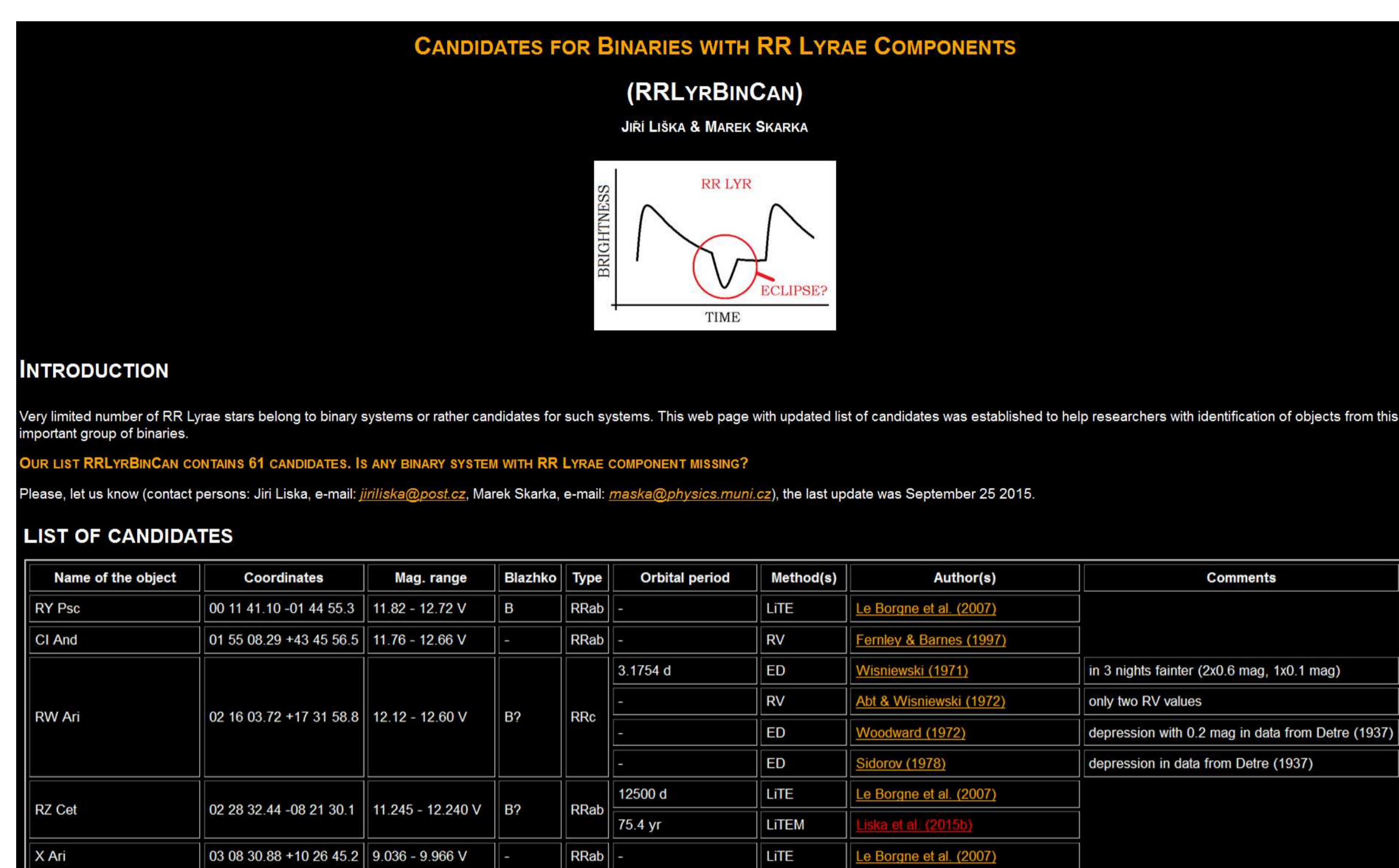


FIGURE 1: Screenshot of the *RRLYrBinCan* database on the web page: <http://rrlyrbincan.physics.muni.cz/>.

## 3 Statistics of the candidates

Based on information in actual version of *RRLYrBinCan* database (25<sup>th</sup> September 2015) we give a basic statistics. The main table contains 85 records for 61 stars. From this sample 13 stars (21.3 %) belong among RR Lyrae Blazhko stars and 5 of them (8.2%) are suspected of modulation. The majority of stars are of RRab type (59, 96.7%), only 2 stars are of RRc type. Histogram with mean *V*-brightness of candidates (Fig. 2, the left panel) shows two populations which are the results of observational selection effects. One group consists bright stars from the galactic field (8–15 mag), the second of stars from the galactic bulge and near galaxies (LMC, Ursa Minor Dwarf Galaxy) in the range 16.5–20 mag.

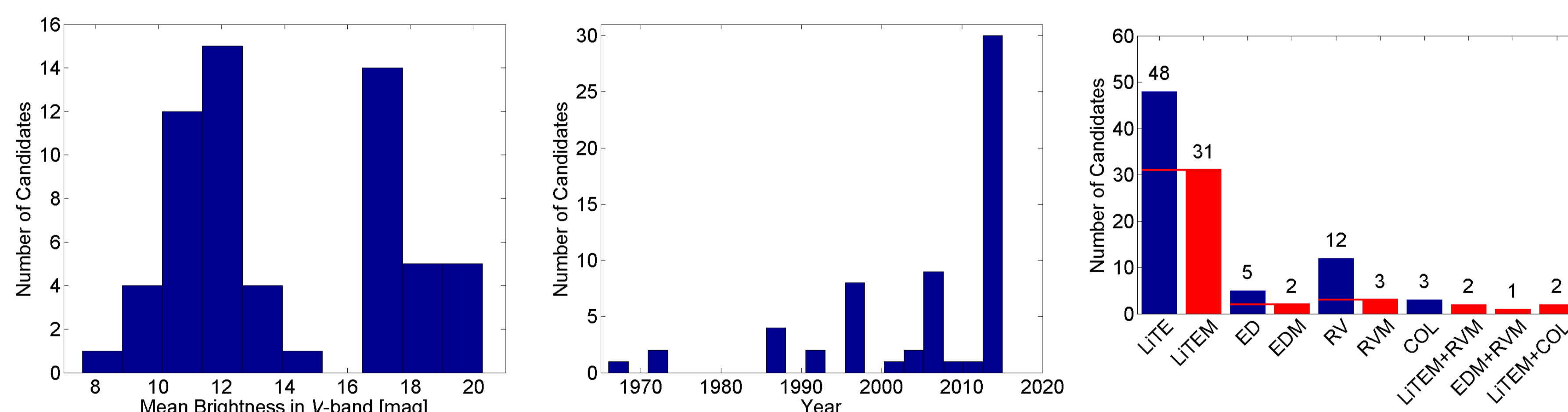


FIGURE 2: Distribution of mean brightness of candidates in *V* filter (the left panel), a time distribution of their discovery (the central panel), and candidates distribution according to the detection methods (the right panel).

The number of candidates, which have been revealed since the sixties of the 20<sup>th</sup> century, has steeply increased in the last years (mainly in 2014 and 2015) see the central panel in Fig. 2.

Listed objects are divided into several classes according to the detection methods/processes. We use following abbreviations in our database: LiTE – possible Light Time Effect is apparent in *O–C* diagram, ED – Eclipse(s) were Detected, RV – systematic shifts in Radial Velocities were detected, COL - systematic colour discrepancy in comparison with other RR Lyrae stars was found. The abbreviations with letter "M" at the end of their mark (LITEM, EDM, RVM) represent previous detection methods which were in addition used for calculation of orbital model of the binary and found parameters are available (not only orbital period). From the Fig. 2 (the right panel) it is evident that detection of the LiTE is the most successful way to reveal the binarity (48 systems, 78.7%). Orbital parameters of expected binaries of a half of the sample (28 objects, 45.9%) have not been determined. The binarity was revealed using two or more methods in several cases.

## 4 Discussions and conclusions

We introduce a new database of candidates for RR Lyrae stars in binary systems. Short summary of actual state of the list is presented. Extension of the list with the objects from catalogues of pulsating binaries (Zhu 2010, ver. 2014; Sztatmary 1990), for which are original references missing, and with the stars from globular clusters belongs among future plans.

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