

Photometric Differences Between Modulated and Non-Blazhko ab-type RR Lyrae Stars in the Galactic Bulge

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We present our results of searching for differences in light curves of modulated and non-modulated RRab stars in the Galactic bulge. We examined a sample of more than 8000 stars. The most important results are that Blazhko stars have shorter pulsation periods, less skewed mean light curves, lower mean amplitudes, larger rise-time, no difference in spatial distribution, and metallicity.

1 Introduction

The amplitude and phase/period modulation of the light curve in RR Lyrae stars is known as the Blazhko (BL) effect (Blazhko, 1907). The origin of the modulation has still not been satisfactorily explained (see the overviews by Kovács, 2016; Smolec, 2016). We aimed to search for possible differences in light-curve shape (*I* filter) between BL and non-modulated stars in the fundamental mode RR Lyrae stars (RRab) in the Galactic bulge (observed by the OGLE survey, Soszyński et al., 2014).

2 Methods

We employed classical Fourier decomposition techniques to identify the BL effect in the frequency spectra and describe the shape of the light curve via phase-independent Fourier coefficients (Simon & Lee, 1981). The BL effect was searched among 8282 RRab stars with well-defined light curves brighter than 18th mag (for details see Prudil & Skarka, 2017).

3 Results

We identified modulations in 3341 RRab stars. From the comparison between light curves of modulated and non-BL stars, we found that BL stars have shorter pulsation periods on average, which is given by the decreasing number of BL stars with pulsation period above 0.6 days.

Modulated stars seem to be characterized by small amplitudes and long rise times (RT), while among non-BL stars the situation is exactly the opposite. Consequently,

Table 1: Comparison of mean light-curve parameters of BL and non-BL stars from the Galactic bulge.

	P (days)	Amp (mag)	R_{21}	R_{31}	ϕ_{21} (rad)	ϕ_{31} (rad)	RT	[Fe/H] (dex)
non-BL	0.564(1)	0.577(3)	0.491(1)	0.319(1)	4.450(4)	2.832(7)	0.169(3)	-0.962(5)
BL	0.533(1)	0.540(3)	0.458(1)	0.274(1)	4.367(4)	2.616(8)	0.219(8)	-0.969(5)

Fourier amplitudes, R_{i1} , are larger for stars with stable light curves, while phase parameters, ϕ_{i1} , are lower in comparison with modulated stars. These findings are given by the less skewed mean curves of modulated stars. The comparison between the parameters can be found in Table 1.

We also examined photometric physical parameters estimated on the basis of empirical formulae (for example, metallicity from Jurcsik & Kovács, 1996). Metallicity was found to be the same for BL and non-BL stars. Also the spatial distribution seems to be homogeneous, and BL and non-BL stars are well mixed without preference to any direction or location in the Galactic bulge. More details can be found in Prudil & Skarka (2017).

From the R_{31} vs. ϕ_{i1} diagrams, it seems that two Oosterhoff (1939) groups can be present in the Galactic bulge (see Prudil et al., 2017, this proceedings).

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