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On the Phase-Modulation Properties of Galactic Bulge RRab Stars

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Abstract. A thorough investigation of the OGLE-IV Galactic bulge data (Soszyński et al. 2014) is performed, in order to test whether the weakening/disappearance of the phase modulation in Oosterhoff type-II stars, which was supposed to be detected in M3 (Jurcsik 2019), is a general property of the Blazhko modulation.

The Oo-type I and II RRab stars were separated according to their location on the period-amplitude Bailey diagram (see details in Prudil et al. 2019). The phase modulation was defined as the full range of the phase changes indicated by the light curves belonging to six Blazhko phase intervals. Its strengths was measured as the *i*) the phase change of the mean brightness value on the rising branch; *ii*) the phase change of the maximum brightness; and *iii*) the phase variation of the f_0 Fourier component. It was found that the phase-modulation is weaker in OoII stars than in OoI stars in the Galactic bulge, too. This conclusion remains valid to any definition of the phase modulation applied and also to the 8-year long OGLE-IV data or, in order to reduce the effect of possible period changes on the results, its 3-year segments are analysed.

However, because the selection of the OoII Blazhko stars is based on the location in the period - mean amplitude diagram and the amplitudes of stars showing large-amplitude phase modulation are suppressed, there might be some bias in the selection of the OoII sample towards skipping variables with reduced mean amplitudes. The low number of OoII type Blazhko stars detected in the bulge seems to support this possibility. Nevertheless, even if the selection of the OoII stars is biased, a strong gradient in the strength of the phase-modulation from small to large pulsation amplitudes is evident at any period as it can be seen in Fig. 1.

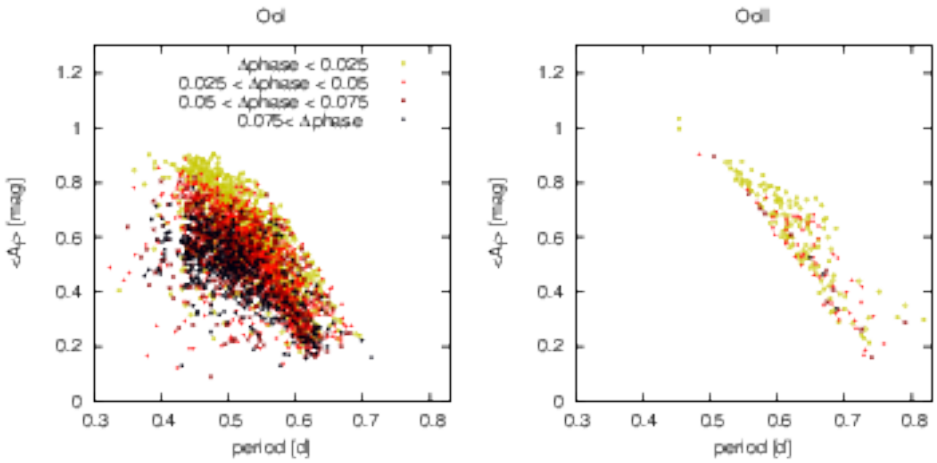

Figure 1. Comparison of the strength of the phase-modulation of OoI and II Galactic bulge Blazhko stars. Using different measures of the phase modulation 25-35% of the OoI stars show the intense phase modulation properties (denoted by brown x and black dot symbols). This is in high contrast with the 5–10% occurrence rate of strong phase modulation in OoII star.

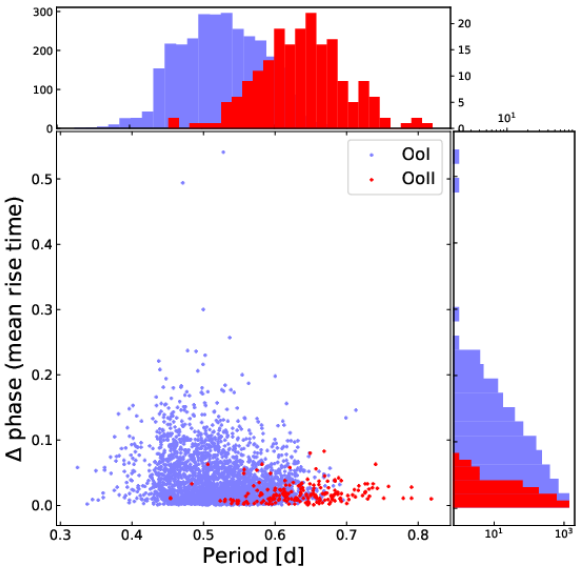

Figure 2. Distribution and statistics of the periods and phase-modulation strengths of the OoI and OoII Galactic bulge Blazhko stars. Data correspond to the phase change of the mean brightness on the rising branch determined for a 3 year long segment of the OGLE-IV data. The histograms of the phase modulation strength (right-side panel in the figure) indicate exponential decrease towards large values for OoI stars (note the logarithmic scale), while it drops sharply for OoII variables.

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References

Jurcsik, J. 2019, MNRAS, 490, 80
Prudil, Z., Dékány, I., Grebel, E. K., et al. 2019, MNRAS, 487, 3270
Soszyński, I., Udalski, A., Szymański, M. K., et al. 2014, Acta Astron., 64, 177