

New Data on Period Changes of the RR Lyrae Stars in the Globular Cluster M53

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Abstract. We present new data on the period changes of seven RRab stars in the globular cluster M53. The most interesting result of this work is the strong evidence for cyclic period changes for more than half of the studied RR Lyrae variables.

1. Introduction

The metal-poor ($[\text{Fe}/\text{H}] \approx -2$) globular cluster M53 (NGC 5024) is known to contain 45 RR Lyrae variables (Clement 1997). Archival observations of M53 together with our new data span almost 80 yr. Such a long time baseline gives the possibility of studying period changes of RR Lyrae stars. We present the preliminary results for several RRab variables.

2. Observations

In order to study period changes of RR Lyrae stars in globular cluster M53 we took a series of CCD frames through *VI* filters in two overlapping fields. These two fields contain 28 known RR Lyrae variables. Observations were carried out in the spring of 1998 and 1999 using a 60-cm telescope located at Białków Observatory.

3. Results

None of the O–C diagrams presented for seven RRab variables can be reasonably described by a parabola. The best candidate which shows a period change with constant rate is star v7. The O–C diagram for this variable is shown in Fig. 1. Fitting a parabola to this diagram yields the rate of period change of 0.19 d Myr^{-1} . This would indicate that the period is increasing with good agreement with theoretical predictions for stars in the final stage of their redward evolution from the horizontal branch (Lee 1991). It must be noted, however, that a better fit is obtained with two straight lines, indicating an abrupt period change of $+0.9 \text{ s}$.

Surprisingly, the period changes of four other RRab variables (v1, v6, v8, and v9) seem to be cyclic. This type of period variations is most clearly visible for v8 (see Fig. 2). These long-term variations with periods of about 60–70 yr can probably be explained by the light-time effect in a binary system.

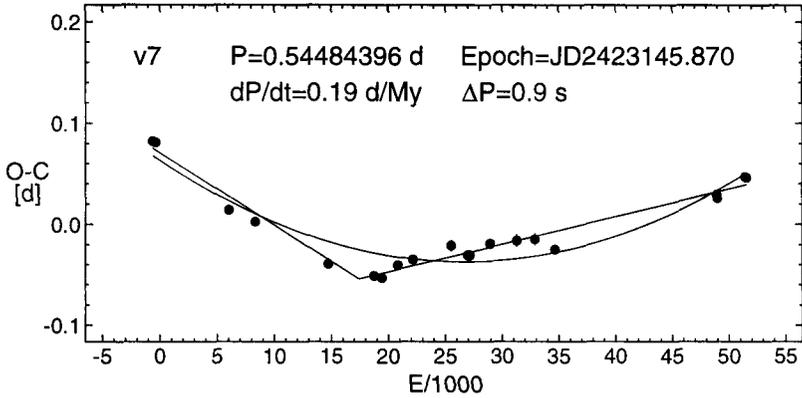


Figure 1. O–C diagram for variable v7.

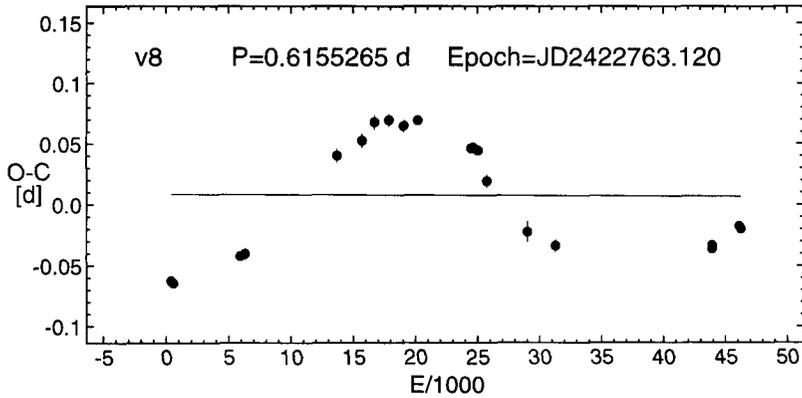


Figure 2. O–C diagram for variable v8.

Acknowledgments. This work was supported by Wrocław University grants 2196/W/IA/98 and 2041/W/IA/99, and KBN grant 2 P03D 016 11.

References

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