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PHYSICAL PARAMETERS OF RR LYRAES IN GLOBULAR CLUSTERS FROM LONG TERM CCD PHOTOMETRY

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We describe an ongoing program of CCD photometry of selected globular clusters aimed to study the light curves shapes and long term variations in RR Lyrae star. The Fourier parameters, i.e. the detailed light curve shapes, are a function of the metallicity and evolutionary stages. We present examples of light curves in the V and R filters for RR Lyraes in the globular clusters M3. As 50 cm-class telescopes are suitable for the project, this is a call for collaborations.

From the fit parameters of light curves, the Fourier parameters are defined as the amplitude ratios $R_{ij}=A_i/A_j$ and the phase differences $\phi_{ji} = i\phi_j - j\phi_i$ and are these parameters which define the shape of the variation curves and the ones that are to be calibrated in terms of physical parameters.

This project started with the systematic observations of three globular clusters; M3 (Fe/H= -1.57), M15 (Fe/H= -2.25) and M92 (Fe/H= -2.29). These were selected mainly because they have been the subject of good CCD observing programs in the recent past (M3: Carretta et al. 1998; M92: Buonanno et al. 1983) and because their mean metallicities are adequate to infer the influence of the metallicity in the fourier parameters. The fact that they have been studied photometrically in the recent past, provides us with a larger time base, both the known variables and the ones that might be discovered, allowing better estimations of their periodicities, and mid-term variations that are characteristic of many RR Lyrae stars such as the Blazhko effect and the period variations.

Examples of relationships between observables, such as period and the Fourier parameter ϕ_{31}, and physical parameters like stellar masses, luminosities and temperatures in RRc stars can be found in the work of Simon & Clement (1993) and for RRab stars in (Kovács & Jurcsik 1997). These calibrations have been applied for example to RRc field stars by Poretti (2001) and to RRab stars in the globular

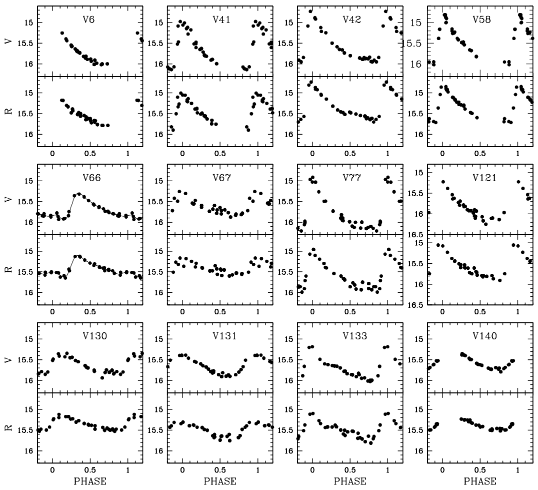

Fig. 1. Light curves of RR Lyraes in M3.

cluster NGC 6934 (Kaluzny et al. 2001). The systematic application of such calibrations to large samples of globular cluster stars will render insights to the trends defined by the physical conditions in the stellar environments.

Small size telescopes, of the order of 50 cm., are suitable for the project, provided they are equipped with a CCD camera. Those interested are warmly invited to get in touch with the author.

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