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SOME RECENT RESULTS IN THE THEORY OF NONLINEAR STELLAR PULSATIONS

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Abstract. We focus the discussion on the utilization of the very nonlinear nature of the light curves of classical pulsating stars (Cepheids and RR Lyrae stars).

1. BUMP CEPHEIDS

Following the suggestion of Simon & Schmidt (1976) it has been shown (Buchler, Moskalik & Kovács 1990; Kovács & Buchler 1989) that the characteristic variation of the bump on the light and velocity curves of the Galactic Cepheids is caused by the $2\omega_0 \approx \omega_2$ resonance between the fundamental and first overtone modes. This connection between the frequencies of the normal modes and the nonlinear feature on the light curve enables us to estimate the masses of the Bump Cepheids. This is very similar to the method applied in the case of the double-mode stars. In a follow-up paper Moskalik, Buchler & Marom (1991) proved that due to the recently found enhancement of the metal opacities (Rogers & Iglesias 1992), the bump masses become concordant with those given by the evolution theories.

2. METAL ABUNDANCES OF CEPHEIDS AND RR LYRAE STARS

Considering the general idea of the dependence of the shape of the light curve on the star's physical parameters, Kovács & Zsoldos (1995) showed that there exist simple relations between the observed iron abundances and the Fourier parameters of the light curves of RR Lyrae stars. The method enables one to estimate [Fe/H] from the light curves alone. Jurcsik & Kovács (1995) successfully applied the method on an independent sample of globular cluster variables. In a subsequent paper Zsoldos (1995) extended the method to the Galactic Cepheids.

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