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DISCOVERY OF OVERTONES AND RESONANCE OSCILLATIONS IN
BETA CANIS MAJORIS AND IN BETA CEPHEI

A thorough investigation on the radial velocity variation of Beta CMa has disclosed the existence in this star of at least ten different oscillations. These are resp. the free pulsations in the fundamental mode and in the first five overtones (P_0, P_1, \dots, P_5) and the difference oscillations $P_{i,i+2}$, arising from the coupling between the P_i and the P_{i+2} , from P_{02} to P_{35} .

The ratios P_i/P_0 are entirely consistent with the theoretical predictions for the polytrope of index 3 and $\Gamma_1 = 1.53$.

Of the two periods that have been detected earlier the longer one, $0^d.2513003$, appears to correspond to the free pulsation in the fundamental mode P_0 , while the shorter one, $0^d.2500246$, is the period P_{24} of the coupling term between the second and the fourth overtones.

The line broadening is connected with the pulsation in the fundamental mode.

A similar investigation carried out on Beta Cep has lead to the discovery of 55 different oscillations, all with measurable amplitudes. They are: the first ten overtones P_1, P_2, \dots, P_{10} , the difference oscillations $P_{i,i+2}$ between them (9 in number), the further difference oscillations $P_{i,i+3}$ (3)

$P_{i,i+4}^{(7)}$, $P_{i,i+5}^{(6)}$, $P_{i,i+6}^{(5)}$, $P_{i,i+7}^{(4)}$, $P_{i,i+8}^{(3)}$,
 $P_{i,i+9}^{(2)}$ and $P_{i,i+10}^{(1)}$.

The corresponding amplitudes range from 20 km/sec for the main oscillation to 0.8 km/sec for the smallest.

The ratios P_i/P_0 for the first four overtones are again those foretold by the theory for the polytrope of index β with $\Gamma_1 = 1.52$.

The single period given in the GCVS corresponds to the main oscillation which is $P_{24} \equiv P_0$. So P_{24} is at perfect resonance with P_0 , as was the case in ν Eri.

The absence of line broadening in this star is ascribed to the absence or the extreme weakness of the directly excited fundamental pulsation P_0 .

The results thus far obtained from the five stars Theta Oph, ν Eri, Beta Cep, Beta Cru and Beta CMa show a continuous increase of Γ_1 from 1.51 for the shortest main period to 1.53 for the largest.

Full results will be published in the Zeitschrift für Astrophysik.

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