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ON THE RADIAL PULSATIONS OF THE DELTA SCUTI STARS SIGMA OCTANTIS AND B OCTANTIS

The southern Delta Scuti variables σ Octantis (=HR 7228= HD 177482) and B Octantis (= HR 8294= HD 206553) were discovered by McInally and Austin (1978). Recently these stars have been again observed by Coates et al. (1981), who plan in the future to measure the colour indices of B Octantis in order to locate its position within the instability strip.

In the present note, on the basis of our results (Tsvetkov, 1981 a,b) we estimate the expected locations of these two variables within the instability strip and discuss the possible pulsation modes of B Octantis.

1. σ Octantis. Coates et al. (1981) determined a single oscillation period $P = 0.097$ day with a visual light amplitude $\Delta V = 0.025$ mag. They indicate that σ Octantis pulsates probably in the fundamental mode only. In such a case, from our semiempirical period - luminosity relation for this mode one may estimate its absolute magnitude: $M_{bol} \simeq M_v = (1.60 \pm 0.23)$ mag. σ Octantis is not likely situated near the observed blue edge of the instability strip, where the Delta Scuti stars pulsate in overtones. At the above evaluated luminosity, its effective temperature within the observed instability strip (Breger, 1979) is expected to be in the range $3.83 \leq \log T_e \leq 3.90$.

2. B Octantis. In this case the problem is more complicated. Coates et al. (1981) found two oscillations: one with a period $P = 0.063$ day and an amplitude $\Delta V = 0.010$ mag, and an other with $P = 0.143$ day and $\Delta V = 0.014$ mag. The authors note that the observed period ratio of 0.44 cannot be obtained from oscillations in the four lowest modes. It is known that the radial pulsations of Delta Scuti stars lead to the following mean period

ratios: $\langle P_1/P_o \rangle \simeq 0.76$, $\langle P_2/P_o \rangle \simeq 0.62$, $\langle P_3/P_o \rangle \simeq 0.52$.

We suggest that the observed period ratio for B Octantis may be explained, if one accepts that this star pulsates in both fundamental mode and fourth (or perhaps fifth) overtone. Indeed, if the mean value of the pulsation "constant" for the fourth overtone is $\bar{Q}_4 \simeq 0.015$ day, then with $\bar{Q}_o \simeq 0.033$ day one derives a mean period ratio $\langle P_4/P_o \rangle \simeq \bar{Q}_4/\bar{Q}_o \simeq 0.45$ in a good agreement with the observed period ratio ratio for B Octantis. Assuming that the observed period of 0.143 day may be attributed to the fundamental mode, one may estimate the absolute magnitude of this star: $M_{bol} \simeq M_v = (1.12 \pm 0.23)$ mag. At such a luminosity, pulsations in the fundamental mode within the observed instability strip are possible for $3.82 \leq \log T_e \leq 3.90$.

In conclusion we notice that there is an evidence for oscillation in a high mode for other variables too (Tsvetkov, 1981 b): V 1004 Ori (= HR 2100 = HD 40372) and BN Cnc (= HD 73763). For these two stars, in particular, one obtains an "observed" pulsation "constant" of 0.015 day, which indicates a mode higher than the third overtone ($\bar{Q}_3 \simeq 0.017$ days). Hence the observations give evidences that some Delta Scuti variables may perform radial oscillations in the fourth (or even fifth) overtone.

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