g-MODE INSTABILITY IN THE MAIN SEQUENCE B-TYPE STARS

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We show that the OPAL opacities, in addition to explaining the origin of β Cep stars pulsations, also predict existence of a large region in the Main Sequence band at lower luminosities, where high-order g-modes of low harmonic degrees, l, are unstable. The excitation mechanism remains the same and is due to the usual κ-effect acting in the metal opacity bump ($T \approx 2 \times 10^5$K). The new instability domain nearly bridges the gap in spectral types between δ Sct and β Cep stars. Periods of unstable modes are in the range $0.4 - 3.5$ days for $l = 1$ and $l = 2$. We propose that this excitation mechanism causes photometric variability in the Slowly Pulsating B-type stars (SPB stars, Waelkens 1991) and perhaps in other B stars whose variability in the same period range has been reported.

Typically, there is a large number of modes simultaneously unstable in one model. Most of them have $l > 2$. Such modes are not likely to be detected photometrically but may be visible in line profile changes. The excitation of many high-l modes in a star may also cause a spurious contribution to the rotational $v \sin i$ values.

Sequences of unstable modes at each l exhibit periodically varying departure from equal spacing in period. This feature, first noted in White Dwarf g-mode spectra (calculated and measured), in present case is a probe of the region left behind the shrinking core (μ-gradient zone). We discuss prospects and difficulties of SPB star asteroseismology.

This is the abstract of the paper which will appear in *MNRAS*.

References

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