

LIGHT AND LINE PROFILE VARIATIONS DUE TO r-MODE
PULSATIONS
With an application to the ZZ Ceti Star G117-B15A

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ABSTRACT. We present a general formulation for the effects of r-mode nonradial pulsations on the light curves and line profiles of a slowly rotating star, given a pulsation model and model atmospheres. We show that the temperature perturbation, the gravity perturbation and the light variations are proportional to the spheroidal component of the displacement, while the velocity perturbation is proportional to the toroidal component. Therefore, when calculating the observable effects of r-mode pulsations, it is necessary to include both the toroidal and spheroidal components of the displacement in the calculations.

We apply our formalism to the pulsating DA white dwarfs, known as the ZZ Ceti stars. Specifically, the ZZ Ceti star G117-B15A has a peculiar period structure which led Kepler *et al.* (1982) to propose its pulsations were r-mode pulsations. We observed the wings of the H δ line of G117-B15A photometrically using the 2.1m Struve telescope at McDonald Observatory for a total of 11 hours and compared our theoretical results with the observations. Our results indicate the observed variations of G117-B15A are not caused by r-mode pulsations, but are consistent with g-mode pulsations.

REFERENCES

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