

# On the Comparative Study of Gravity Modulated Rayleigh-Bénard Convection Involving Free-free, Rigid-free, and Rigid-rigid Boundaries

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## ABSTRACT

The boundary effects on gravity-modulated thermal convection are considered. A unified approach based on the Lorenz system has been used to study linear and weakly nonlinear stability analyses. Small and large amplitude modulations are considered for performing linear stability analysis. A modified Venezian approach together with the superposition principle predicts the motions corresponding to small-amplitude modulations. The existence of subharmonic motions for the case of large-amplitude modulations is explored using the Floquet theory-based solution of the Mathieu equation. Heat transport was quantified using the Nusselt number for different amplitudes and frequencies of modulation. In general, it is found that gravity modulation has a stabilizing effect on the convection process in all three boundary types.

**Keywords:** Rayleigh Bénard Convection, Floquet theory, Nusselt number, Mathieu equation.

