

# Exploring feedback control on the stability, heat transport in the Darcy-Bénard convection under g-jitter

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## 1. INTRODUCTION & OBJECTIVE

The paper deals with the impact of g-jitter (gravity modulation) on the stability and heat transport in the Darcy-Bénard convection of Newtonian fluid with feedback control. The lower and upper surfaces are rigid, featuring the third type thermal boundary condition on the upper surface. The method incorporated to carry out a linear stability analysis consists of the combination of the single term Galerkin method and the Maclaurin series expansion via Newton-Raphson method. To perform a weakly nonlinear stability analysis, the approach of the multi-scale method is employed, yielding a non-autonomous Ginzburg-Landau equation. Using the non-autonomous Ginzburg-Landau equation, the impact of the controller gain parameter, gravity modulation on the stability and the heat transport in the system has been examined. The observations from the study have confirmed that the controller gain parameter stabilizes the system whereas the gravity modulation has oscillatory effect on the stability of the system. Results also guarantees that the heat transport in the system is enhanced by the amplitude of the gravity modulation and diminished by the frequency of the gravity modulation. Furthermore, it is found that the system's heat transport can be controlled by appropriately adjusting the controller gain value.

## 2. HIGHLIGHTS AND RESULTS OF IMPORTANT POINTS

The effect of controller gain parameter is to promote the stability of the system by dissipating disturbances and hence to reduce the heat transport in the system. The effect of increase in the amplitude of the gravity modulation strengthens the heat transport in the system and promotes commencement of convection and thereby is seen as a destabilizing agent for the system. The effect of increase in the frequency of the gravity modulation diminishes the heat transport in the system and delays the onset of convection and stabilizes the system. The gravity modulation has oscillatory effect on the system.

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