

Feedback control and heat transfer measurements in a Rayleigh-Benard convection cell

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PHYSICS OF FLUIDS

Volumen: 29

Número: 7

Número de artículo: 074103

DOI: 10.1063/1.4991909

Fecha de publicación: JUL 2017

Tipo de documento: Article

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Resumen

We report experimental results on the heat transfer and instability onset of a Rayleigh-Benard convection cell of aspect ratios 6:3:1 filled with a high Prandtl aqueous solution of glycerol under feedback control. We investigate the transient and stationary response of both local temperature readings and heat transfer fluxes on the Rayleigh Benard cell in both conductive and convective states when we perform two independent feedback control actions on both hot and cold walls. We evaluate the performance of both controllers to maintain a temperature gradient independently if the system is below or above the convection threshold. As the convection cell can be rotated at 180 degrees about the shorter axis of the cell, it was possible to perform transitions between thermal conduction and convection regimes and vice versa under a constant temperature difference maintained by both independent controllers. The experimental setup provided an accurate measurement of the critical Rayleigh number and the evolution of the Nusselt number as a function of the Rayleigh number in the moderately supercritical regime ($Ra < 10(4)$). Flow visualizations show a steady cellular convection pattern formed by 6 transverse rolls throughout the range of Rayleigh numbers. Published by AIP Publishing.

Palabras clave

KeyWords Plus: [AQUEOUS-SOLUTIONS](#); [ACTIVE CONTROL](#); [VISCOSITY](#); [STABILITY](#); [CONTAINER](#); [MOTION](#); [BOXES](#)

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Financiación

Entidad financiadora	Número de concesión
Mecesp	UCH0310
Fondecyt	1085020

[Ver texto de financiación](#)

Editorial

AMER INST PHYSICS, 1305 WALT WHITMAN RD, STE 300, MELVILLE, NY 11747-4501
USA

Información de la revista

- Impact Factor: [Journal Citation Reports](#)

Categorías / Clasificación

Áreas de investigación: Mechanics; Physics

Categorías de Web of Science: Mechanics; Physics, Fluids & Plasmas