TOR VERGATA
UNIVERSITÀ DEGLI STUDI DI ROMA

Dipartimento di Fisica

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Seminar

Monday, 18 September 2023 - h. 14:30

Fisica della Materia room (Department of Physics)

Prof. Emily CHING

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"Turbulent natural convection between two differentially heated vertical plates: A theoretical study"

Abstract

Turbulent natural convection in a fluid between two differentially heated vertical plates, known as turbulent vertical convection, is a common model system for thermally driven turbulent flows. One important question of interest is to understand the dependence of the heat flux normal to the plates on the Rayleigh and Prandtl numbers, the two control parameters of the flow. In this talk, we shall first explain why it has been a theoretical challenge to understand how heat flux depends on Rayleigh and Prandtl number in turbulent vertical convection. Then we shall discuss our recent theoretical study, which is based on the mean momentum and thermal balance equations with minimal closure approximations. Our theoretical analysis gives the dependence of the Nusselt number as well as the wall shear stress on Rayleigh and Prandtl numbers and these dependences are found to be in excellent agreement with existing direct numerical simulation data.

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