Flow structure in a Rayleigh-Bénard cell with rough plate

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Abstract

Turbulent thermal convection is ubiquitous in nature. It is a complex problem because the flow is forced at several scales, because of the presence of both large scale circulation and small scale plumes. In addition, the difference of density induced by temperature adds an ingredient in the basic equations, so that turbulence could be different from the case of pure mechanical forcing. Mixing is, in principle, different and probably increased by the structure of the plumes. We use two laboratory model systems: the Rayleigh-Bénard cell, which consists in a fluid layer heated from below and cooled from above, and the heat pipe, which consists in a channel between an hot chamber and a cold chamber. These flows model two limit types of forcing: the former is strongly influence by the boundary conditions, the latter by the turbulence in the bulk. There are several methods to investigate those systems: global heat transfer measurements and scaling laws, or small-scale properties and Lagrangian tracking.

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