ID de Contribution: **261**

Type: **Contribution orale**

Turbulent transitions in thermal convection

mercredi 5 juillet 2023 15:30 (15 minutes)

Thermal convection is a complex physical problem which involves phenomena at various length scales: thermal plumes arise from buoyancy instable boundary layers, and their interactions yield a large scale flow which itself shears the boundary layers and produces a turbulent bulk. A simple model system is the Rayleigh-Bénard cell which consists in a fluid layer between smooth plates, usually within Boussinesq conditions: the only fluid property which varies with temperature is density, and only at first order in the buoyancy term. The bottom plate is heated, the top plate is cooled. In this system, the two control parameters are the Rayleigh number and the Prandtl number. They allow to accurately predict the threshold of convection.
For higher thermal forcings, the boundary layers are expected to further destabilize, and the flow may become fully turbulent. The question of the threshold of this new fully turbulent regime, as well as the analysis of the obtained flow which is inhomogeneous and anisotropic, has been a hot problem for the last 20 years. In particular, laboratory experiments in Grenoble have evidenced a transition to a regime of higher heat-transfer which was interpreted as the transition to the fully turbulent regime, sometimes referred to as "the ultime regime"of convection. Other laboratory experiments do not evidence any such transition, in the same range of Rayleigh and Prandtl numbers.
New approach are possible to go beyond this apparent contradiction, by focusing on the characterization of the turbulent bulk in Rayleigh-Bénard cells: to that end, we use mostly visualization methods such as shadowgraph and Lagrangian tracking of tracer particles. We add roughness to the plate to promote boundary layer destabilization, and use several working fluids to explore the parameter range: deiozied water, fluorocarbon and low temperature liquid helium.

Affiliation de l'auteur principal

CNRS

Auteur principal: SALORT, Julien (CNRS Laboratoire de physique)

Co-auteur: Mme CHILLÀ, Francesca (ENS de Lyon)

Orateur: SALORT, Julien (CNRS Laboratoire de physique)

Classification de Session: Mini-colloques: MC24 Bicentenaire des équations de Navier-Stokes

Classification de thématique: MC24 Bicentenaire des équations de Navier-Stokes