ESPCI
Laboratoire PMMH
10 rue Vauquelin, 75231 Paris Cedex 05

Séminaire PMMH

Salle de réunion du PMMH, Campus Jussieu, Bâtiment Cassan A, 1 er étage

Vendredi 15 février 2019, 11h00-12h00

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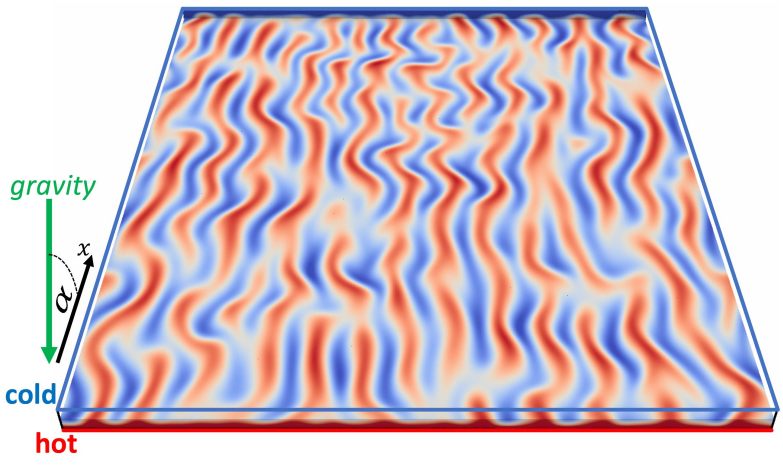
A network of invariant solutions underlying spatio-temporal patterns in inclined layer convection

Thermal convection in a fluid between two horizontal plates, a lower hot plate and an upper cold plate, exhibits chaotic dynamics and turbulence. If such a convection cell is inclined against gravity, buoyancy forces drive hot and cold fluid up and down the incline leading to a shear flow in the base state and the emergence of complex dynamics and spatio-temporal patterns.
We study the dynamics of inclined layer convection (ILC) using a fully nonlinear dynamical systems approach based on a state space analysis of the governing equations. Exploiting the computational power of highly parallelized numerical continuation tools based on matrix-free Newton methods, we compute a collection of invariant solutions of ILC and discuss their bifurcation structure. Specifically, fixed points, travelling waves, periodic orbits and heteroclinic orbits will be shown. At intermediate angles of inclination, we demonstrate how a simple network of invariant solutions guides moderately complex dynamics. The complexity of the dynamics increases with the intensity of the basic shear flow. At high inclination angles, localized patches of weakly turbulent convection within a background of straight longitudinal convection rolls are observed. We present exact invariant solutions capturing both the dynamics and the spatial localization of these so-called transverse bursts.



Prochain séminaire : vendredi 22 février 2019, Jean-Arthur Olive (ENS)
Programme des séminaires : www.pmmh.espci.fr, onglet *Séminaires PMMH*
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