“Ultimate state” of two-dimensional Rayleigh-Bénard convection

Charles R. Doering
University of Michigan, Ann Arbor

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Rayleigh-Bénard convection is the buoyancy-driven flow of a fluid heated from below and cooled from above. Heat transport by convection an important physical process for applications in engineering, atmosphere and ocean science, and astrophysics, and it serves as a fundamental paradigm of modern nonlinear dynamics, pattern formation, chaos, and turbulence. Determining the transport properties of high Rayleigh number convection turbulent convection remains a grand challenge for experiment, simulation, theory, and analysis. In this talk, after a general survey of the theory and applications of Rayleigh-Bénard convection we describe recent results for mathematically rigorous upper limits on the vertical heat transport in two dimensional Rayleigh-Bénard convection between stress-free isothermal boundaries derived from the Boussinesq approximation of the Navier-Stokes equations. The bounds on the heat transport scaling challenge some popular theoretical arguments regarding the asymptotic high Rayleigh number convection. This is joint work with Jared Whitehead.

The lecture will take place in Thackeray 704 at 3:00pm.
Refreshments will start at 2:30pm.