1085-76-228 **Charles R. Doering*** (doering@umich.edu), Departments of Mathematics and Physics, and Center for the Study of Complex Systems, University of Michigan, Ann Arbor, MI 48109-1043.
Ultimate state of two-dimensional Rayleigh-Bénard convection.

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 theory. Determining the transport properties of high Rayleigh number convection turbulent convection remains a challenge for experiment, simulation, theory, and analysis. In this talk, after a brief survey of the theory and applications of thermal convection we describe recent results for rigorous upper limits on the vertical heat transport in two dimensions between stress-free isothermal boundaries derived from the Boussinesq approximation of the Navier-Stokes equations (Rayleigh's original model). These bounds on the heat transport scaling challenge one popular theoretical argument for asymptotic high Rayleigh number convection. This is joint work with Jared Whitehead. (Received September 10, 2012)