

1025-65-252

Cheng Wang* (wang@math.utk.edu), 1403 Circle Drive, Department of Mathematics, University of Tennessee, Knoxville, TN 37996. *Numerical study for three-dimensional Boussinesq system with infinite Prandtl number.* Preliminary report.

The three-dimensional Rayleigh-Benard convection with infinite Prandtl number is taken into consideration. Such a system is derived under an assumption that the viscous time scale of the fluid is much shorter than the thermal diffusive time scale. In this talk, the Gauge formulation is proposed to facilitate the numerical simulation of the system. In the reformulation, an auxiliary variable and the gauge variable are introduced to avoid the difficulty related to Lagrange multiplier. As a result, the pressure gradient disappears and the incompressibility constraint becomes a Poisson equation for the gauge variable. Moreover, an explicit boundary condition for the auxiliary variable is proposed, using vertical extrapolation on the boundary. This drastically improve the numerical efficiency. The overall numerical scheme is proven to be unconditionally stable and a full convergence is derived. Some numerical simulation results are to be presented as well. (Received January 23, 2007)