

Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Stochastic Thermal Convection DANIELE VENTURI, XIAOLIANG WAN, GEORGE KARNIADAKIS, Brown University — Stochastic bifurcations and stability of natural convective flows in 2d and 3d enclosures are investigated by the multi-element generalized polynomial chaos (ME-gPC) method (Xiu and Karniadakis, SISC, vol. 24, 2002). The Boussinesq approximation for the variation of physical properties is assumed. The stability analysis is first carried out in a deterministic sense, to determine steady state solutions and primary and secondary bifurcations. Stochastic simulations are then conducted around discontinuities and transitional regimes. It is found that these highly non-linear phenomena can be efficiently captured by the ME-gPC method. Finally, the main findings of the stochastic analysis and their implications for heat transfer will be discussed.

George Karniadakis
Brown University

Date submitted: 04 Aug 2005

Electronic form version 1.4