Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

**POD models for turbulent convection in rectangular cells** JORGE BAILON-CUBA, JOERG SCHUMACHER, Technische Universität Ilmenau — Two low-dimensional models (LDM) for turbulent convection in rectangular cells, based on the Galerkin projection of the Boussinesq equations onto a finite set of empirical eigenfunctions, are presented. The empirical eigenfunctions are obtained from a Proper Orthogonal Decomposition (POD) of the fields using the Snapshot Method. The first case is a three-dimensional cell in which a classical turbulent Rayleigh-Bénard flow evolves. The second case is based on two-dimensional DNS data of mixed convection in a cell with heated obstacles as well as in- and outlets of air. In both cases, a quadratic inhomogeneous coupled ODE system is obtained for the evolution of the modal amplitudes. The truncation to a finite number (a few hundred) of degrees of freedom, requires the additional implementation of an eddy viscosity-diffusivity to capture the missing dissipation of the small-scale modes. The magnitude of this additional dissipation mechanism is determined by requiring statistical stationarity and a total dissipation that corresponds with the original DNS data. We introduce a mode-dependent eddy viscosity-diffusivity, which turns out to reproduce the large-scale properties of the turbulent convection qualitatively well.

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Date submitted: 02 Aug 2011 Electronic form version 1.4