Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Aspect-ratio effect on Natural Convection subject to horizontal temperature gradient HUIDAN YU, NING LI, , ROBERT ECKE, Los Alamos National Laboratory — Direct numerical simulations of natural convection in low aspect-ratio (AR) cavities with heated and cooled side walls and adiabatic top and bottom are performed. Three cavities with $AR = 0.5$, 1, and 2 are simulated in the range of Rayleigh number (Ra) from 1 to 10^8 and Prandtl number $Pr = 0.71$. Mean velocity magnitude, Nusselt number (Nu), and boundary layer thicknesses are computed as functions of Ra. In the laminar flow regime with Ra approximately from 10^3 to 10^7, power-law scalings $\sim Ra^{\beta}$ of velocity magnitude, Nu, and boundary layer thicknesses are found in three cavities. Threshold Ra values are examined at the onset of the power-law growth in each cavity. Aspect-ratio effect on flow structure and heat transfer are demonstrated.

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Date submitted: 01 Aug 2006 Electronic form version 1.4