Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

2D Mixed Convection Thermal Incompressible Viscous Flows
BLANCA BERMUDEZ, F.C.C. BUAP, Mexico, ALFREDO NICOLAS, UAM-Iztapalapa, Mexico — Mixed convection thermal incomprressible viscous fluid flows in rectangular cavities are presented. These kind of flows may be governed by the time-dependent Boussinesq approximation in terms of the stream function-vorticity variables formulation. The results are obtained with a simple numerical scheme based mainly on a fixed point iterative process applied to the non-linear system of elliptic equations that is obtained after a second order time discretization. Numerical experiments are reported for the problem of a cavity with fluid boundary motion on the top. Some results correspond to validation examples and others, to the best of our knowledge, correspond to new results. To show that the new results are correct, a mesh size and time independence studies are carried out, and the acceptable errors are measured point-wise. For the optimal mesh size and time step the final times when the steady state is reached, as solution from the unsteady problem, are reported; it should be seen that they are larger than the ones for natural convection which, physically speaking, show the agreement that mixed convection flows are more active than those of natural convection due to the fluid boundary motion on the top of the cavity. The flow parameters are: the Reynolds number, the Grashof number and the aspect ratio.

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Date submitted: 16 Sep 2005 Electronic form version 1.4