Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Vortex dynamics and nonlinear characterization of the bifurcation in the flow in an oscillatory cavity.[1] GUILLERMO OVANDO, GUADALUPE HUELSZ, EDUARDO RAMOS, Centro de Investigación en Energía UNAM, HECTOR JUÁREZ, UAM-I — The flow in a rectangular cavity driven by the oscillatory motion of the vertical walls has been numerically studied for three different Reynolds numbers (Re) based on the cavity width: 50, 500 and 1000 and three different displacement amplitudes of the vertical oscillatory walls (Y=amplitud/width) of 0.2, 0.4 and 0.8. The vortices cores were identified using the Jeong-Hussain criterium and two vortex formation mechanisms are found: M1) the oscillatory shear motion of the moving walls, combined with the dephasing of the fluid motion inward the cavity and the presence of the fixed walls and M2) the abrupt change in the flow direction at the corners of the cavity. We found that vortices occupy smaller areas as the Reynolds number increases. All cases studied shown cyclic and axial symmetries, except for the largest case (Re=1000, Y=0.8), where the axial symmetry is lost. We interpret this phenomenon as a bifurcation and characterize it by analyzing the variation of the kinetic energy along the vertical central axis (x=0), averaged over one cycle (l^2) as a function of the Reynolds number (for Y=0.8). The behaviour of l^2 as a function of Re indicates that the loss of axial symmetry is via a supercritical pitchfork bifurcation.

[1]This work was partially supported by CONACYT U41347-F project.

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Date submitted: 04 Aug 2006 Electronic form version 1.4