Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

**Torus Streamlines in the 3D Steady Lid-driven Cavity Flows** KATSUYA ISHII, ITC, Nagoya University, CHIKARA OTA, CES, Nagoya University, SHIZUKO ADACHI, Tokyo International University — Streamlines of the incompressible vortical flows in three-dimensional rectangular cavities with different aspect ratios are numerically studied for several Reynolds numbers by using a combined compact finite difference (CCD) scheme with high accuracy and high resolution. The flow is driven by a lid moving tangentially with constant speed. Non-dimensional geometrical parameters of the cavity are the depth-to-width aspect ratio $\Gamma$ and the span-to-width aspect ratio $\Lambda$. The flow parameter is the Reynolds number Re. We study the flow structures in the square cavity ($\Gamma$=1) with the spanwise aspect ratios $\Lambda$=1 and 6.55 for Re from 100 to 400. Torus streamlines are obtained from the velocity field of the steady incompressible flow. Several other streamlines show chaotic behavior. They are equivalent to a non-autonomous Hamiltonian system of one-degree-of-freedom. In order to examine the features of the flow pattern with different parameters, we analyze the Poincare sections in the cross sections of cavities.

Katsuya Ishii
ITC, Nagoya University

Date submitted: 03 Aug 2011 Electronic form version 1.4