Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

The role of geometry on the equilibrium configurations of two dimensional, inviscid channel flows[1] LAI PAN YIP, KWOK CHOW, University of Hong Kong, DAVID GURARIE, Case Western Reserve University — The effect of aspect ratios on the equilibria of channel flows with vorticity is studied. Numerical simulations of two dimensional, inviscid channel flows with no slip boundary conditions are performed. Starting with random initial conditions, the flows undergo self-organization and attain equilibrium with special arrangements of vortices depending on the aspect ratio (ratio of channel width to streamwise period). An inviscid, semi-Lagrangian code is employed, where interpolation mimics the effects of mixing. To study the role of geometry, the aspect ratio of the channel is varied from 0.1 to 1.0 (from very narrow to relatively wide channel). In particular, three or more pairs of vortex dipoles per period appear when the aspect ratio is very small ($\sim$0.1), but there is only one such pair for larger aspect ratio ($\sim$0.5). More exotic configurations, such as triangular diploes and highly asymmetric dipole structures, are found for still larger values of aspect ratios. The relationship between vorticity and stream function is studied through scatter plots. Three types of relations are identified, namely, multi-sinh curves, symmetric sinh curve and highly shifted sinh curve.

[1]Supported by Hong Kong Research Grants Council.

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Date submitted: 06 Jul 2006 Electronic form version 1.4