Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Solving turbulent wall flow in 2D using volume-penalization on a Fourier basis G.H. KEETELS[1], TU/e, H.J.H. CLERCX[2], TU/e, UT, G.J.F. VAN HEIJST, TU/e — The volume-penalization method allows in principal the use of fast Fourier pseudospectral techniques to simulate turbulent wall flows. Convergence checks with respect to the spacial resolution, time stepping and the penalization strength are presented where a challenging dipole-wall collision simulation serves as a benchmark (obtained by a high-resolution 2D Chebyshev scheme). It is found that Gibbs oscillations have a minor effect on the flow dynamics, which allows post-processing techniques to recover higher order accuracy. The procedure is much cheaper than the more classical Chebyshev Navier-Stokes solvers. Therefore the potential is further examined by considering the statistical properties of fully developed 2D turbulence in bounded domains with Reynolds numbers substantially larger than previously possible.

[1]TU/e: Dept. of Physics, Eindhoven University of Technology, P.O. Box 513, 5600 MB Eindhoven, The Netherlands
[2]UT: Dept. of Applied Mathematics, University of Twente, P.O. Box 217, 7500 AE Enschede, The Netherlands

G.H. Keetels
TU/e

Date submitted: 12 Jul 2006 Electronic form version 1.4