Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Direct numerical simulation of turbulent plane Couette flow at Rew=6000 JIE GAI, ZHENHUA XIA, QINGDONG CAI, State Key Laboratory for Turbulence and Complex Systems, College of Engineering, Peking University, Beijing 100871, P. R. China — The large-scale counter-rotating streamwise vortices (secondary vortices) in fully-developed plane Couette flow have been reported by both experimental and numerical communities. However, the number of vortex pairs does not increase linearly with the spanwise width of the domain, which is the same as the reported results of the turbulent Taylor-Couette flow. In present work, a series of direct numerical simulations at Reynolds number of 6000 (based on the relative wall speed and half the channel height δ) with different streamwise and spanwise lengths were conducted to investigate the effect of the box size on the large-scale structures. Our results showed that the correlation of secondary structures in the box with smaller streamwise length is much stronger than that with larger streamwise length and the rate of the turbulent kinetic energy contributed by the secondary structures is influenced by the mean spanwise scale of the secondary eddies and the streamwise length of the computational domain. In addition, the spanwise length scale of each secondary vortex pairs was found in a domain of $4(1 \pm 0.3)\delta$.

Jie Gai
State Key Laboratory for Turbulence and Complex Systems,
College of Engineering, Peking University, Beijing 100871, P. R. China

Date submitted: 21 Jul 2014 Electronic form version 1.4