Abstract Submitted for the DFD07 Meeting of The American Physical Society

Alternation of a Pair of Streamwise Vortex by Bubbles TAKA-MASA SUZUKI, YOSHIHIKO OISHI, YUICHI MURAI, YUJI TASAKA, YA-SUSHI TAKEDA, Hokkaido University — The streamwise vortices sensitively govern the turbulent momentum transport in boundary layers. In order to find out the frictional drag reduction mechanism by bubbles, we experimentally investigate the interaction between the artificial streamwise vortices and the bubbles. The spanwise and the heightwise velocity field of the vortex was obtained by Particle Image Velocimetry (PIV). When the bubbles exist inside the vortex, the spanwise interval between the vortex cores is 1.6 times longer and the enstrophy is a half times smaller than the single-phase condition. These two phenomena deduce the momentum exchange reduced by the interaction. Numerical bubble trajectory on the velocity field also has shown perpendicular oscillation that provides local negative stress around the vortices. This occurs only for small bubbles, being consistent to high persistency of the drag reduction.

> Yuji Tasaka Hokkaido University

Date submitted: 30 Jul 2007

Electronic form version 1.4