

Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Drag Reduction of a Sphere by Ambient Perturbation and its Relationship with Stokes Layer MASAYA MUTO, MAKOTO TSUBOKURA, NOBUYUKI OSHIMA, Hokkaido University — An interaction between boundary layer of a sphere and equivalent Stokes layer generated by a perturbation in solid-air two-phase flow has been investigated using numerical simulation. In this simulation, the sphere is fixed in a cylindrical channel. Particle Reynolds number in this study is around 200 that means the wake of the sphere is steady and axisymmetric, and the friction drag and the pressure drag of the sphere are comparable. As a result of simulation, a drag reduction was found in a uniform flow with single-period perturbation oscillating in the same direction as the uniform flow when Stokes layer thickness is smaller than twice of boundary layer thickness in the sphere surface. A reason of the reduction of drag force is a reduction of friction drag caused by that fluctuation energy generated by the perturbation concentrates in the vicinity of particle and the time averaged velocity gradient becomes smaller.

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Date submitted: 10 Aug 2009

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