Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Forces on a Spherical Particle in Linear Shear Flow INCHUL KIM[1] — Accurate prediction of particle dispersion is important in many two-phase flows. When particles are submerged in a shear flow, there are lateral forces on the particles, and these lateral forces affect the dispersion of the particles very much. Saffman (1965) derived an expression for the lift force on a spherical particle for Re<<1. The lift force in Saffman's expression is toward the higher velocity side in a shear flow. Subsequently, Dandy and Dwyer (1990), Kurose and Komori (1999), and Bagchi and Balachandar (2002) performed numerical investigation for finite-Reynolds-number flows. All these authors used a small computational domain ranging 20 to 30 sphere radii. The result by Dandy and Dwyer shows that the lift force is toward the higher velocity side. The results by Kurose and Komori and by Bagchi and Balachandar show that the sign of the lift force changes, respectively, at Reynolds number about 14 and 55.5 for the dimensionless shear rate 0.1. To provide correct numerical data for the forces on a spherical particle in linear shear flow, the present author has performed an accurate numerical computation for$1 \leq Re \leq 200$. The effects of computational domain size and space resolution were examined, and accurate converged numerical results have been obtained.

[1]membership pending

Inchul Kim
University of Michigan-Dearborn

Date submitted: 26 Aug 2005 Electronic form version 1.4