Abstract Submitted
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Effect of gravity on particle dispersion in upward gas turbulent channel flow[1] YOICHI MITO, Kitami Institute of Technology — Fully-developed concentration fields of solid particles with a large range of inertial time constants in a plane channel in which gas is flowing turbulently in the upward direction are calculated by using direct numerical simulation to calculate the gas velocities seen by particles and a Lagrangian method to calculate trajectories of particles. The objective is to examine the effects of gravity and of inertia, both of which represent trajectory mechanisms that decrease turbulent dispersion, on particle transport in wall-bounded turbulent flow. The frictional Reynolds number is 150. Density ratio is 1000. The Stokesian inertial time constants made dimensionless with the friction velocity and kinematic viscosity are 5, 10, 20, 40, 100, 200. Three Froude numbers, Fr = 0.02, 5 and infinity, are considered. Forces exerted by particles on the gas and inter-particle collisions are not considered. Effect of gravity on particle dispersion is not seen at Fr $\geq$ 5. The particle turbulence decreases due to the effect of gravity at Fr = 0.02. The effect of gravity increases with increasing particle inertia and with increasing the distance from the wall. It disappears in the viscous wall region where particles are disengaged from gas turbulence structures due to their inertia.

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