Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Relative diffusion of a pair of inertial particles in the inertial subrange of turbulence KEI ENOHATA, Nagoya University, KOJI MORISHITA, Kobe University, TAKASHI ISHIHARA, JST CREST, Nagoya University — Turbulent diffusion of a pair of inertial particles in 3-dimensional homogeneous and isotropic turbulence was studied using direct numerical simulation (DNS) with 2048^3 grid points; the Taylor micro-scale Reynolds number in the DNS is approximately 425. For each set of the inertial particles with different values of the Stokes number ($St = 0, 0.1, 0.2, 0.5, 1, 2, 5, 10$), 256^3 particles are tracked using cubic spline interpolation for the velocity data in the DNS. Here $St = 0$ corresponds to fluid particles. The DNS showed that for each value of St, the mean square of the distance δx between the two inertial particles grows with time t as $\langle \delta x^2 \rangle \sim C\epsilon t^3$ in the inertial subrange, which is in agreement with Richardson (1926) and Obukhov (1941). Here ϵ is the mean energy dissipation rate per unit mass, and C is a constant of $O(1)$ depending on the value of St and the initial distance between the inertial particles. The DNS shows also that large clusters of strong vortices enhance relative diffusion of inertial particles of $St > 1$.

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Date submitted: 31 Jul 2015 Electronic form version 1.4