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A Statistical Perspective on the Effects of Brownian Particle Movements on the Induced Fluid Flow Field WAY LEE CHENG, REZA SADR, Texas A&M University — Nanofluids, engineered fluids by dispersing nanometer-sized materials in a base fluid, are reported to have anomalous heat transfer characteristics. In spite of the large number of, sometimes conflicting, reports on the existence and magnitude of enhancement, the underlying principles governing the improvements in the heat transfer process is not thoroughly understood. The interaction between the discrete and continuous phases in the fluid is thought to be a major contributor of the observed phenomena. The current study examines the fluid-particles interactions, induced by randomly moving particles suspended in a base fluid, from a statistical perspective, using an affordable computational approach. The fluid-particle interactions are described by Navier-Stokes equations on the fluid phase coupled with Langevine equation for the random walk of the suspended nano particles. Effects of particle diameter, unsteady movement, and hydrodynamics inertia in the fluid are examined in the current model. Results of the simulations show that the random movements of the particles induce a small random flow within the fluid. Statistics of the induced flow field converges asymptotically as the Brownian time-step reduces.

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