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Numerical investigation of drag characteristics of spherical particles under non-isothermal conditions JUNGWOO KIM, YEONG EUN YIM , Seoul National University of Science and Technology — In predicting particle-laden flows related to particle transport and dispersion, better understanding and accurate parameterization of the hydrodynamic forces on the particles are one of the important subjects. Heat transfer between dispersed particle and fluid is often observed in nature and engineering applications. However, existing analytical expressions and empirical correlations used in point particle approaches are made based on the assumption that the particle and surrounding ambient flow are under thermal equilibrium conditions. So, the effect of thermal non-equilibrium state of particle motion remains an unresolved issue. Therefore, we perform three-dimensional numerical simulations for the flow around a finite-sized spherical particle in order to investigate its drag characteristics under non-isothermal conditions (heated or cooled particles). In this study, the working fluids are considered to be water and air as typical cases of liquids and gases. The heated particle experiences larger drag in air and smaller drag in water than that in the isothermal case. On the other hand, the impact of cooling is to decrease drag in air and to increase it in water. These behaviors of the drag coefficient in air and water mainly depend on the variation of the viscosity in terms of the temperature. Those results would provide useful information in understanding the particle motion in heated or cooled conditions.

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