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Fully resolved simulation of the settling motion of a finite-sized spherical particle in a cellular flow field[1] JUNGWOO KIM, Seoul National University of Science and Technology — For particle-laden flows related to particle transport and dispersion, a knowledge of particle settling velocity is one of the important subjects. In that respect, for last several decades, many numerical studies with point particle approaches have been done. However, existing analytical expressions and empirical correlations used in point particle approaches are made based on many assumptions including the fact that the particle size is much smaller than the typical length scale of a given flow field. So, the settling velocity of a finite-sized particle in turbulent flows remains an unresolved issue. Therefore, we perform fully resolved simulations of the settling motion of a finite-sized spherical particle in a cellular flow field. The cellular flow field considered has been regarded as one of the good model problems for the study of the particle settling. One of the important parameters is the ratio of the particle diameter (d) and the cell size in the cellular flow (L). In this study, the change of the particle settling velocity is examined in the range of $0.01 \leq d/L \leq 0.1$. In addition, the instantaneous drag and lift force components are compared with existing expressions for the corresponding force on the particle. Those results would show the validity and limitation of the present point particle approach in understanding the settling motion of a spherical particle in turbulent flows.

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