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Transport and two-way coupling effect of inertial particles by large-scale and very-large-scale motions in turbulence[1] GUIQUAN WANG, DAVID RICHTER, University of Notre Dame — Direct numerical simulations two-way coupled with inertial particles are used to investigate the particle distribution and two-way coupling effects associated with the large-scale motions (LSMs) and very-large-scale motions (VLSMs) in an open channel flow at a moderate Reynolds number. One method of filtering the VLSMs from the flow is via artificial domain truncation, which alters the mean particle concentration profile and particle clustering due to the removal of VLSMs from a large domain simulation. In order to exclude possible correlation of the turbulence introduced by a small domain size with periodic boundary conditions, low- and high-pass filtering is performed during the simulation to isolate the particle interaction with different spatial scales. The results show that particle accumulation and turbophoresis are under-predicted without VLSMs, whereas the particle clustering and two-way coupling effects are mainly determined by particle coupling with LSMs. In the inner layer, the elongated streamwise anisotropic particle clustering can be reproduced by particles coupling solely with LSMs for low Stokes number particles. However, we do not observe similar particle clustering behavior in the outer layer as seen in the full simulation.

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