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Analysis of flow characteristics in turbulent bubbly channel flow through the velocity decomposition[1] IN-KOO LEE, JAEHEE CHANG, HAECHEON CHOI, Seoul National University — The instantaneous velocity in a turbulent bubbly flow has been so far decomposed by the mean and fluctuation velocities. In our study, we decompose the velocity into the mean velocity without bubbles (U_0), mean velocity deviated from U_0 by bubbles (ΔU), and the fluctuating velocity. In this decomposition, we use an ensemble averaging on the velocity fields containing bubbles with respect to their wall-normal positions. We apply this decomposition to turbulent bubbly channel flow, using direct numerical simulation. ΔU contains a horseshoe vortex behind each bubble located close to the wall, which significantly affects the Reynolds stress distribution there. From turbulent fluctuations, counter-rotating vortices behind bubbles are mainly observed irrespective of their wall-normal locations. Quasi-streamwise vortices occurring in a single-phase flow is suppressed by the dynamic motion of near-wall bubbles.

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