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Immersed Boundary and VOF Coupling Method for Bubble-Particle Interaction Problems[1] RYUICHI IWATA, TAKEO KAJISHIMA, Osaka University, SHINTARO TAKEUCHI, University of Tokyo — A new approach for the direct numerical simulation of three-phase flows is described. The method permits the simulation of the flow induced by a large population of bubbles and particles in a gas-liquid-solid system. Implementation of moving rigid surfaces is based on an immersed boundary method (IBM) of the body-force type, also developed by the present authors. In this method, the inter-phase momentum exchange is calculated by the distributed interaction force field shared by both the Eulerian (fluid) and Lagrangian (particles) frameworks. The gas-liquid interfaces are captured by the volume of fluid (VOF) method including surface tension. To assess its validity, the present method is applied to the piercing of the free surface of a liquid by a rising cylinder. Further applicability of the method is demonstrated in a 3-D situation, in which a rising bubble interacts with many settling particles.

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