

## **Abstract**

Numerical simulation of multiphase flows with complex interfaces and large density ratios has never been an easy work. In this paper, a multi-phase SPH model for interfacial flows is presented. This model is based on the assumption that the pressure field is continuous over the interfaces and avoids directly using the information of particle density which is discontinuous over the interfaces. The widely used artificial stability treatments on interfaces, which help to improve the interfacial sharpness, are not used in this model because they bring in artificial errors and are unphysical. The density re-initialization algorithm and the coupled dynamic solid boundary treatment (SBT), which have been proven effective in single-phase simulation, are further modified to adapt to the multiphase modeling. A cut-off value of the particle density is set to avoid the negative pressure, which can lead to severe numerical difficulties and may even terminate the simulations. Some numerical tests, including the dam breaking and sloshing with entrapped air, a Rayleigh-Taylor instability test and a non-Boussinesq problem, are presented in this paper. It is demonstrated that the present SPH model is capable of modeling complex multiphase flows with large interfacial deformations and density ratios.