Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Computational modeling for breakup and coalescence of bubbles in a turbulent bubbly flow[1] JAEHEE CHANG, KIYOUNG KIM, HAECHEON CHOI, Seoul Natl Univ — The phase interface in bubbly flows can be simulated with interface-capturing methods such as volume-of-fluid and level-set methods. Although these methods can effectively capture large-scale interface structures, they are limited to grid resolution when resolving small-scale structures. When bubbles breakup or coalesce, small structures such as thin films or ligaments occur, and consequently, interfaces experience non-physical breakup, where the bubble volume and interface structure are lost during simulation. We present a modified level-set method to prevent numerical breakups of thin structures, and to properly simulate the breakup and coalescence of bubbles. The present method distributes additional level-set functions in the regions where interfaces are close to each other, and accurately compute the surface tension and volumes of thin structures. A film-drainage model is used to provide a criterion for the bubble breakup/coalescence, i.e., whether to keep the redistributed level-set function or not. The present method is applied to single bubble breakup and co-axial bubble coalescence, successfully capturing breakup/coalescence events. The method is further applied to a turbulent bubbly flow to investigate the effect of bubble breakup and coalescence.

[1]This work was supported by an NRF project (2017M2A8A4018482) of Ministry of Science and ICT, Korea.

Haecheon Choi
Seoul Natl Univ

Date submitted: 03 Aug 2020 Electronic form version 1.4